Graphing Calculator Tutorials

Student designed lessons

for the TI - 82, TI - 83, TI - 85

GRAPHING CALCULATOR TUTORIALS

TI - 82

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2.	Graphing y = mx + b	Katherine Laggos

TI - 83

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TI - 85

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25.	Numeric Sequences	Dan Kim

Lindsay Bareither
1-20-99

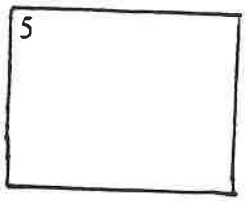
Finding numbers to the 3rd power, the 3rd root, and the x-root

(on a TI-82 calculator)

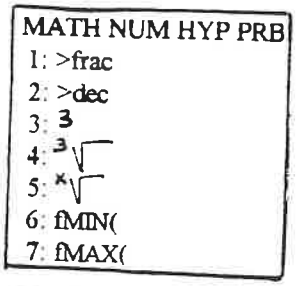
*In order to find a number to the 3rd power, you must follow these simple steps...

Example: Find 5 to the 3rd power (5^3).

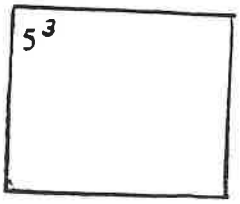
1. Press the number **5**. Your window will look like this...



2. Press the **MATH** key. Your window will look like this...



3. Select **3:^{3}** by pressing **3**. Your window will look like this...



4. Now press **ENTER** and your answer will appear.
If you completed the steps correctly, your answer should be **125**.

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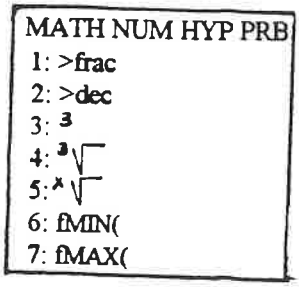
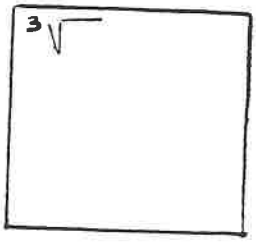
*In order to find the 3rd root of a number, you must follow these simple steps...

Example: Find the 3rd root of 216 ($\sqrt[3]{216}$).

1. Press the **MATH** key. Your window will look like this...



2. Select **4:$\sqrt[3]{\ }$** by pressing **4**. Your window will look like this...



3. Now type in the number you wish to take the 3rd root of.
For example: press **216**

4. Press the [ENTER] key and your answer will appear. You should get **6**.

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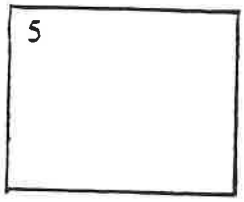
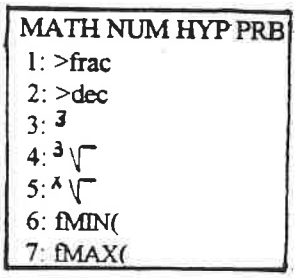
*In order to find any root of a number, you must follow these steps...

Example: Find the 5th root of 243 ($\sqrt[5]{243}$).

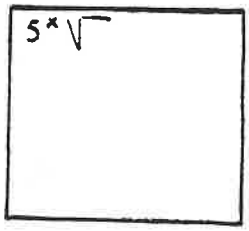
1. Type in the number you wish to be the root. In this case, press [5].
Your window will look like this...



2. Press the [MATH] key. Your window will look like this...



3. Select **5:$^{x}\sqrt{\ }$** by pressing [5]. Your window will look like this...



4. Now type in the number you wish to find the root of.
In this example, press **243**.

5. Press the [ENTER] key and your answer will appear. You should get **3**.

PRACTICE

1. $9^3 = 729$
2. $65^3 = 274625$
3. $10^3 = 1000$
4. $\sqrt[3]{64} = 4$
5. $\sqrt[3]{8000} = 20$
6. $\sqrt[3]{0} = 0$
7. $\sqrt[4]{16} = 2$
8. $\sqrt[7]{16384} = 4$
9. $\sqrt[20]{1} = 1$

Katherine Laggos
January 20, 1999

Graphing the Equation Y=MX+B using the TI-82

To begin, you need to turn on your calculator and make sure the window and mode are set correctly. First, press the [mode] key at the top left of the calculator. When the screen appears, everything on the left should be highlighted, that is "Normal, Float, Radian, Func, Connected, Sequential, and FullScreen." In order to highlight one of these, place the blinking cursor on the word and press the [Enter] key. Once everything on the left is hightlighted, press the [2nd] key and the [MODE] key. You should come to a blank screen. Next, press the [WINDOW] key underneath the screen. Your window should read as follows:

Xmin=-5
Xmax=5
Xscl=1
Ymin=-5
Ymax=5
Yscl=1

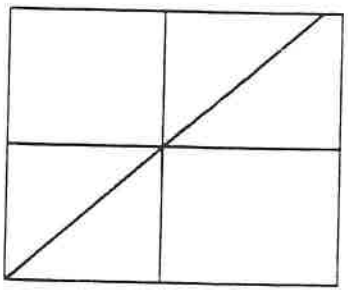
Once this is done, press [2nd] and [MODE] and return to the blank screen. You are now ready to graph the variations of the equation, y=mx+b.

Definitions: M=slope, the change in Y over the change in X.
B= the Y-intercept, or where the line crosses the Y-axis.

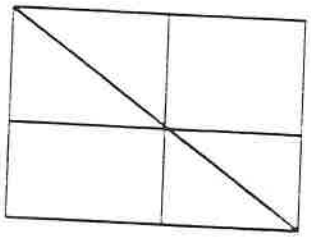
Press the Y= key and a series of Y= lines appear. You will use these lines to type out different equations.

1. Y1=X press [Graph]

This is the graph of Y=X. It is the basic graph in the y=mx+b form. The slope, m, = 1 and b=0.



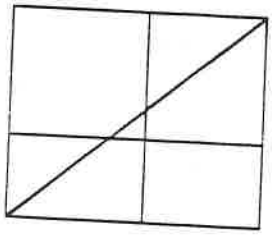
2. Y2=-X press Graph



This is the graph of an equation with a negative slope. M=-1, and B=0.

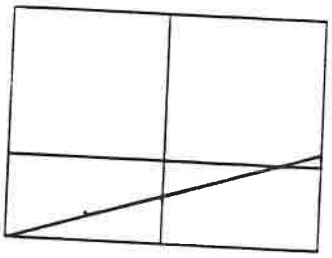
**Therefore, changing the sign of the slope changes the direction of the graph; positive slope means a rising graph, and negative slope means a falling graph. A larger M means a steeper slant to the graph and a smaller one means a smaller slant to the graph, both negative and positive.

3. Y3=X+1 press Graph



Notice in this graph that the equation crosses the y-axis at y=1, and in the equation itself, M=1 and B=1.

4. Y4=X-1 press Graph



Notice in this graph that the equation crosses the y-axis at y=-1, and in the equation itself, M=1 and B=-1.

**Therefore, changing the value of B changes where the equation crosses the Y-axis. Negative B values place the equation underneath the X-axis and positive B values place the equation above the X-axis.

Now try some on your own:

1. Y=2X-1
2. Y=-4X-3
3. Y=X+2
4. Y=-5X+2

Anne Marie Boone '99 1-20-1999

FRACTIONS & DECIMALS WITH THE TI-83

OBJECTIVE:

After completing this worksheet, you should be able to use the fraction and decimal functions on the TI-83 calculator to do two things:

(1) To convert a decimal answer to a fraction answer or a fraction answer to a decimal answer, and

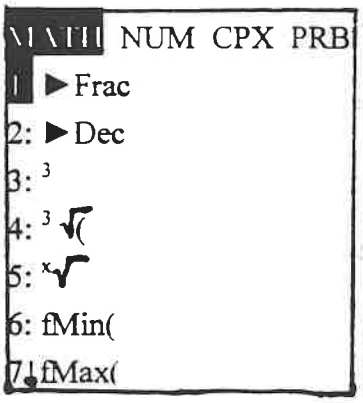
(2) To give an answer in decimal or fraction form.

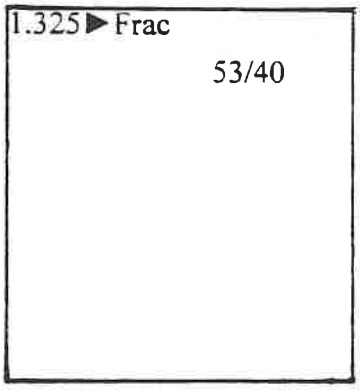
PROCEDURE:

(1) Turn the calculator on by pressing [ON] located in the bottom left hand corner. The screen should be blank. (If it is not, press [CLEAR] located upper right.)

(2) Using the number pad and [.] type in the number 1.325.

(3) Press [MATH] located upper left. The screen should appear as it does below left.

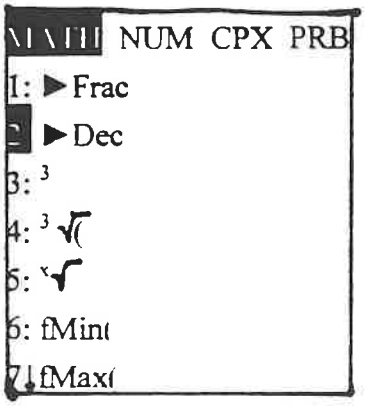


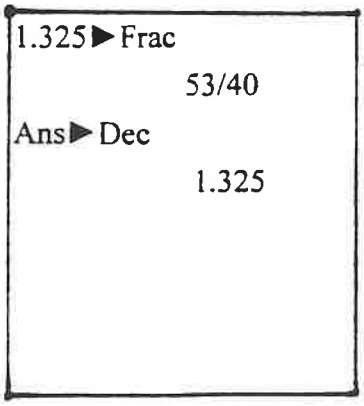


(4) Press [ENTER] twice. The screen should now look as it does above right. You have just converted 1.325 from a decimal to a fraction.

(5) Press [MATH] again and use the arrow keys in the upper right to highlight the decimal function (2:) so the screen appears as it does below left.

(6) Press [ENTER] twice. The screen should appear as it does below right. You have just converted the fraction 53/40 from fraction to decimal form.





NAME_____DATE_____PER____

A. Explain briefly how one would go about determining the answer to each problem in the space provided.

1. Find 72/108 as a decimal then convert to fraction form.

2. Find 3.525 as a fraction then convert to decimal form.

B. For the following problems find the answer in decimal form then convert it to a fraction.

PROBLEM	DECIMAL (first 4 digits)	FRACTION
1. 2/67	_____	_____
2. 95/45	_____	_____
3. 56/99	_____	_____
4. 87/100	_____	_____
5. 34/68 + 23/17	_____	_____
6. 3/16 x 8/9	_____	_____

Things to Notice: If the fraction is already simplified, the FRACTION will not change. If the fraction can be simplified, the FRACTION will be the simplified fraction. If the denominator is a power of ten minus one (9, 99, 999), the decimal equivalent is repeating (ex. .397397 . . .) and can be expressed differently (ex. $.\overline{397}$).

C. For the following problems find the answer in fraction form then convert it to decimal.

PROBLEM	FRACTION	DECIMAL
1. .6312	_____	_____
2. 8.157	_____	_____
3. 0.208	_____	_____
4. .9700	_____	_____
5. 1.431 - .38	_____	_____
6. .502/.46	_____	_____

Things to Notice: If the PROBLEM is greater than one, the numerator (top) of the FRACTION is greater than the denominator (bottom). If the PROBLEM has one or more zeroes at the end of it or before the decimal, the zeroes disappear in the DECIMAL answer.

Jill Blummer
January 19, 1999

ROUNDING WITH THE TI-83

Purpose: to learn how to round decimals with and without the calculator

THE TWO RULES OF ROUNDING WHICH MUST BE MEMORIZED!!

1. If a number ends with 5 or more (6,7,8,9), you round up.

2. If a number ends with 4 or less (3,2,1,0), you round down.

Example 1

Round 1.4239 to the third decimal place.

ALWAYS ASK YOURSELF THE FOLLOWING 3 QUESTIONS

1. How many decimal places? 3
2. What is the digit after 3? 9
3. Do you round up or down? Up

Answer = 1.424

ONE KEY TO ROUNDING IS LEARNING THE NAME OF DECIMAL PLACES.

Number->	1,000	100	10	1	.1	.01	.001
Name->	thousands	hundreds	tens	ones	tenths	hundredths	thousandths

Example 2

Round 3.4549 to the hundredths place

How many decimal places? 2

What is the digit after 5? 4

Do you round up or down? Down

Answer = 3.45

PRACTICE PROBLEM #1

Which of the following would not be rounded to 16?

A. 15.3 B. 15.5 C. 15.701 D. 16.38 E. 16.099

—>

HOW TO ROUND USING A TI-83

Example 3

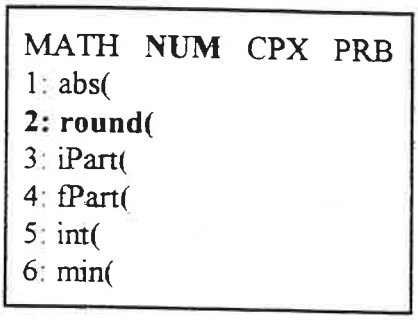
Round 50.785 to the second decimal place

Press

MATH

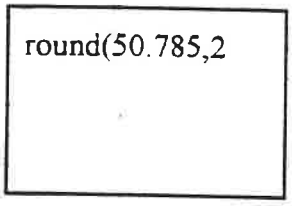
It is located under ALPHA

Use right arrow to move to the second column called NUM
Use down arrow to select **ROUND** (it is second)



YOUR SCREEN SHOULD LOOK LIKE THIS.

PRESS ENTER.
TYPE IN 50.785
PRESS THE COMMA (,) BUTTON ABOVE THE SEVEN.
TYPE IN THE NUMBER OF DECIMAL PLACES YOU ARE ROUNDING TO.
In this problem it is two.



THIS IS WHAT YOUR SCREEN SHOULD LOOK LIKE.

PRESS ENTER-- THE ANSWER APPEARS ON THE NEXT LINE = 50.79

PRACTICE PROBLEM #2
Round 2.3758 to the thousandths.
Did you get 2.376? If you didn't, check the number of decimal places you typed in. It should be 3.

REVIEW PROBLEMS

1. A number ends in 5 or more, you round ____.
2. A number ends in 4 or less, you round ____.
3. Round 6.7845 to the thousandths. ____
4. Round 8.95624 to the hundredths. ____

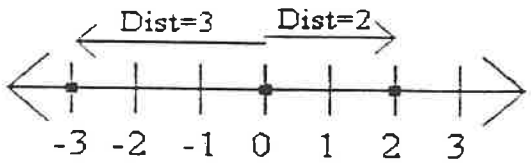
Ryan Smolek

Name:
Date:

Absolute Value

Purpose: To explain how to graph absolute value equations on the TI-83 graphing calculator

Definition of Absolute Value: The absolute value of a number x is the distance that x is from the origin or 0. As you can see on the number line below, the number 2 is 2 units away from 0 to the right, and the number –3 is 3 units to the left of 0. Even though the two numbers go in different directions, their distance from the origin is still positive. The absolute value of any number x, is denoted by |x|. The straight lines around the numbers are called the *absolute value bars.*



Graphs of Absolute Value Equations: Like any other equation, absolute value equations can be graphed. The equation is of the form, y= |x-a| + b, where (a,b) is the coordinate of the vertex. In absolute value equations, there are no discontinuities. This means that every x-value on the graph has a corresponding y-value. The absolute value curve should look like the letter v. If the graph does not have this general shape, the equation has likely been graphed incorrectly.

Steps for Graphing Absolute Value Equations

1. Turn on the calculator by pressing the **ON** key.

2. Press the **Y=** key and delete all equations by using the down arrow key and the **CLEAR** key.

3. Press the **2nd** key and then the **ZOOM** key. In this menu move all options to the left by using the down arrow followed by the **ENTER** key.

4. To create your window, press the **ZOOM** key and press the **6** key to select Zoom Standard.

5. Press **Y=** to enter the equation.

6. If you want to graph, for example, y = |x|, you will need the absolute value function. To get the absolute value function, press the **MATH** key.

7. In the math, menu, press the **RIGHT ARROW** so that you are in the **NUM** section. Hit the **1** key to select **abs(** . You will automatically return to the Y= screen.

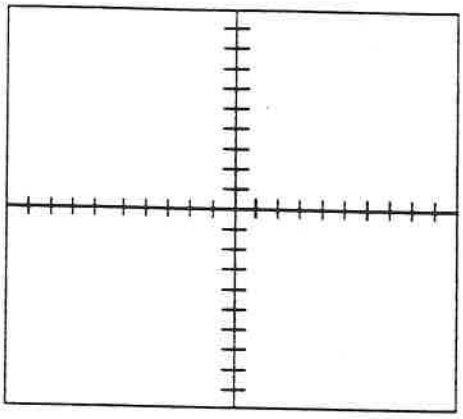
8. Now press the **X,T,θ,N** key to get your x. Close the equation by pressing the **)** key.

9. To view your graph press the **GRAPH** key.

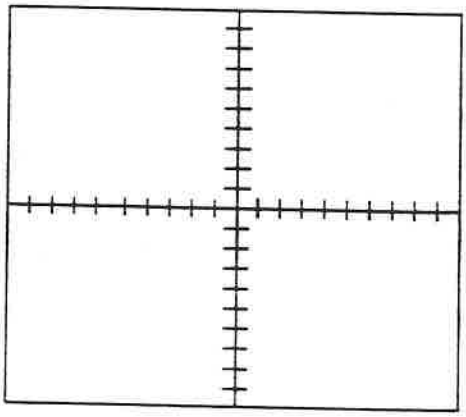
Ryan Smolek

Practice Problems

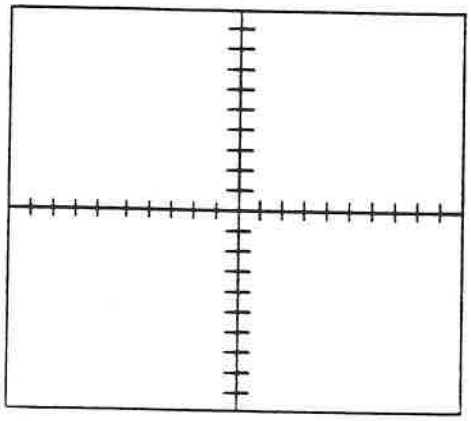
1. Graph the equations: $y= |x|$ and $y= |x+2|$, on your calculator, make a sketch of the graphs in the box below, and describe the differences in the graphs under NOTES.



2. Graph the equation: $y= |x|$ and $y= |x| + 3$, on your calculator, make a sketch of the graphs in the box below, and describe the differences in the graphs under NOTES.



3. Graph the equation: $y= |x+3| + 2$, on your calculator and make a sketch of the graph below.



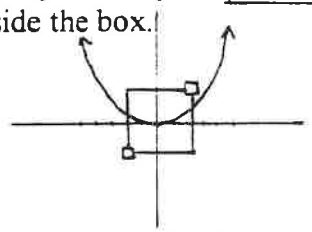
Matthew Kelly
1/19/99
AP Calculus

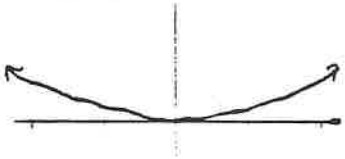
Zoom (ZBox, Zoom In, and Zoom Out)

Name: Date:

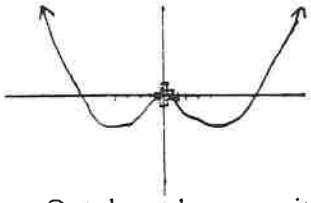
1. Zoom is used to look at the graphs of equations that are put into the calculator. ZBox gives a closer look at the graph as does Zoom In. Zoom Out gives a view of the graph from farther away.

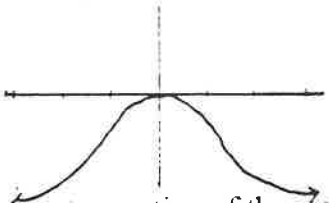
2. To use this you must already have an equation graphed. For ZBox, press [ZOOM] and press 1. The cursor, which you are free to move around, is at the center of the graph. Move the cursor using the arrow pad to any spot that you want to use as the corner of your box, and then press [ENTER] . The cursor changes into a box and as you move it with the arrows, it forms another box. Move the cursor until the box surrounds all of the part of the graph that you want to look at more closely. Then press [ENTER] and the calculator will magnify the section that is inside the box.



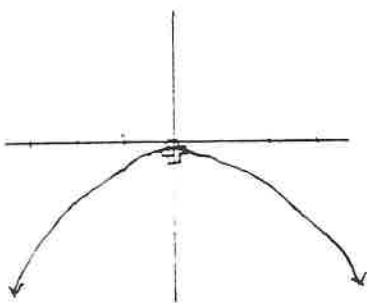


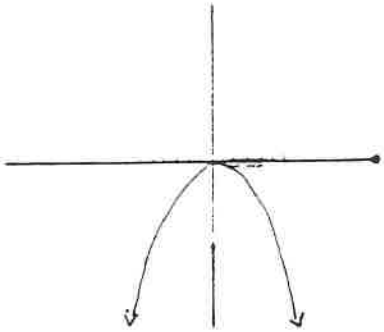
3. Zoom In magnifies the part of the graph that surrounds the cursor location. For the Zoom In command, press [ZOOM] and then press 2. The graph will the appear with the blinking cursor. Move the cursor with the arrows to the middle of the section at which you want to zoom into. Then press [ENTER] and your graph will be magnified. Keep pressing [ENTER] to magnify the graph even more.





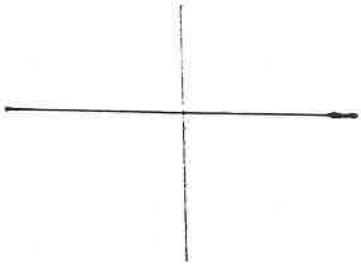
4. Zoom Out does the opposite of Zoom In. It displays a greater portion of the graph instead of a smaller portion. For Zoom Out, press [ZOOM] and the press 3. The graph will appear with the blinking cursor. Move the cursor with the arrow pad to the middle of the section of the graph at which you want to zoom out. Then press [ENTER] and your graph will show a larger portion. Keep pressing [ENTER] to zoom out even more.



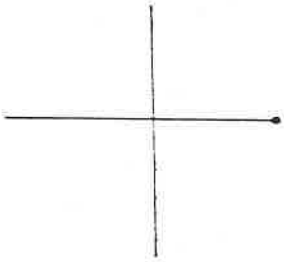


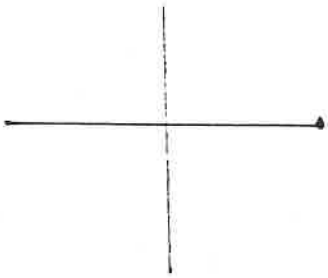
Practice Problems

1. Graph Y = X^2 then
   zoom in using ZBox

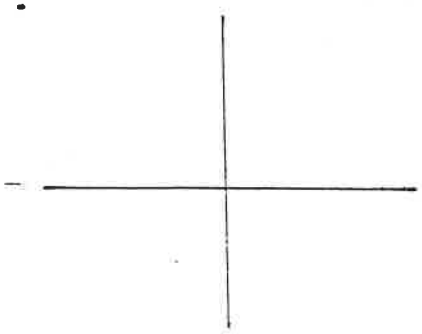


2. Graph Y = 2X^3, then
   use Zoom In to magnify





3. Graph Y = X^(1/2), then
   use Zoom Out to see larger portion



JUSTIN Ipema

Calculating Values With A TI-83

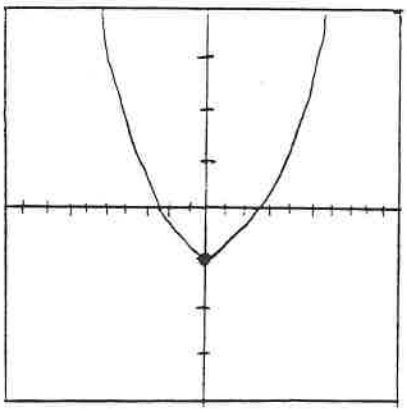
Name:_____ Date:

How to find a Value of a point of an equation using your TI-83.

First, press Y=. Second, type an equation, we will use X^2-5. Now, press the **Window** key. Set to look like:

Xmin	-10
Xmax	10
Xscl	1
Ymin	-20
Ymax	20
Yscl	5
Xres	1

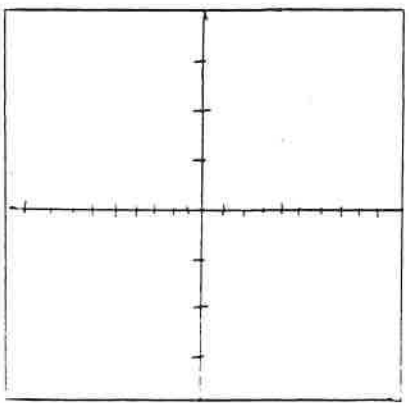
Press **Graph**. It should look like this:



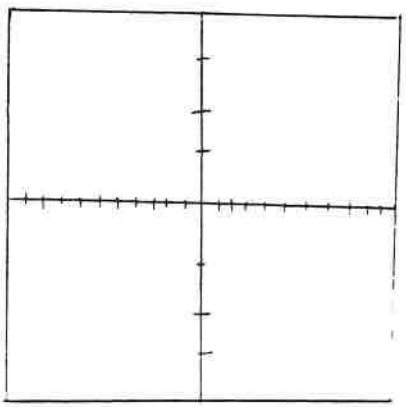
Now press **2nd,** then **Calc.** Press **Enter** or **1.** Press the X coordinate that we want to find the point for. Lets try **0.** The solution is **-5.**

Try some on your own:
Use the same **Window** from before.

$Y= X^3-X^2+1$.
Find Value of Y at **X= 3, 1.6, & .98.**

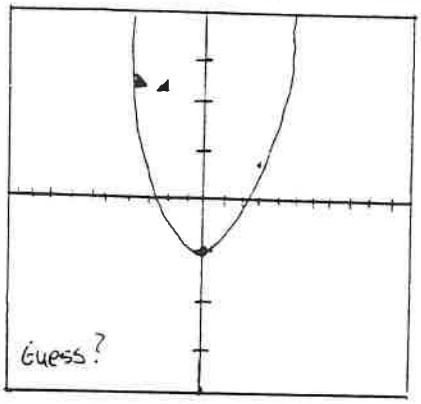


Y=2X+6
Find Value of Y at **X= 0, -7,3, & 9**



How to Calculate the Zero of an Equation

We will use the same **Window** from the previous page and enter the equation $Y=X^2-5$ into the **Y=** window. Press **Graph.** Now press **2nd** and **Calc.** Press either **2** or highlight **2** and press **Enter**. Now you have to place the arrow with **Left Bound?** to the **left** of the point where the curve intersects the **X-axis.** How about around **-3**. Now put the arrow with **Right Bound?** to the **right** of the point of intersection. How about around **-1**. The Screen should look like this:



You don't have to enter a **Guess**, but you can. Press **Enter,** and your answer appeares. It should be **-2.236068.**

Try some on your own.
*Use the same **Window** as before.*

Equation	***Right Bound***	***Left Bound***	***Zero***
$Y= 5x-6$			
$Y= 3x^2-9$			
$Y= 2x -7$			
$Y= 5x^2-7$			

*** ***Some Equations can have more than one Zero.***

Carla Biggs
1/20/99

Value and Zero on the TI-83

Purpose: how to find points and zeros on a graph

Before you start:

1. Adjust your window to look like this

```
Window
  x min = -10
  x max = 10
  x scl = 0
  y min = -10
  y max = 10
  y scl = 0
  x res = 1
```

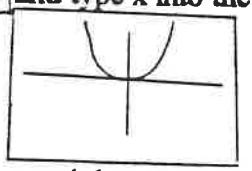
2. In format make sure the left side is highlighted, except for the grid should be on. It should look like this

Rect GC	Polar GC
Coord On	Coord Off
Grid Off	Grid On
Axes On	Axes Off
Label Off	Label On
Expr On	Expr Off

Value: the value key will give you the y-value for any given x of an equation

To explain how to use value, we will use the example equation $y = x^2$ and want to find y when x=2.

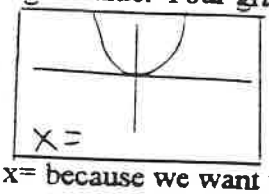
1. First, go into y= and type x^2 into the calculator. Hit the Graph button. Your graph should look like this.



2. Press the 2nd key and then the button that says Calc / Trace. This will take you into the calculate mode. It will look like this

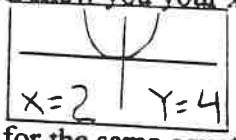
```
Calculate
 1. Value
 2. Zero
 3. Minimum
 4. Maximum
 5. Intersect
 6. dy/dx
 7.  f(x)dx
```

Type 1 or Enter to get Value. Your graph will appear



Enter 2 in for the x= because we want to find y when x = 2. Press Enter

3. Your graph will then show you your x and y values. It should look like this



Now try to find x = 3 for the same equation y= x. Follow the same steps as above. Your answer should be Y = 9.

Sample problems:

Find the y-value for the given x and equation.

1. $y = 3x$; $x = 7$

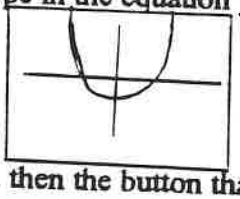
2. $y = 7x^3 + 3x^2 - 2$; $x = 4$

3. $y = \frac{2x^2 - 4}{x}$; $x = -5$

Zero: gives you the point where the equation goes through the x - axis

To explain how to use zero, we will use the example equation $y = x^2 - 2$.

1. First, go to y= and type in the equation $y = x^2 - 2$. Hit the Graph button. Your graph should look like this.



2. Press the 2nd key and then the button that says Calc Trace This will take you into the calculate mode. It will look like the earlier Calculate screen. Press 2 for Zero. Your graph will appear. To find the first zero (the one on the left), use the arrow keys to move the cursor a little above the x - axis and press Enter. Now, move the cursor a little below your zero (x - axis) and press Enter .Press Enter one more time. The screen will display your X and y value. Your x should equal -1.414 when y = 0.

3. Now find the right zero for the same equation, y = x-2. Your x should equal 1.414 when y = 0.

Sample Problems:

Find the zeros for the following equations.

1. $y = 3x^2 - 2$

2. $y = \frac{x^2 - 1}{9}$

3. $y = 7x - .5$

4. $y = 2x^3 - 3x^2 - 6$

Brett Horek
1/16/99

Shading

Name:

Date:

Purpose To show how to shade the area on a graph that is both below one specified function and above another. This task can only be done on the Home screen or in the program editor.

1. Before you can begin, you have to deselect any functions that are stored in the calculator. In order to do that, hit the [Y=] button on the upper left corner of the calculator.

2. If there is a function on the screen, which should look like this then a black box will surround the equal sign. This black box indicates that the function is selected.

```
Y1=X^2
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
Y8=
```

3. To deselect it, move the blinking cursor onto the shaded equal sign and press the [ENTER] button. Because the function is now deselected, the equal sign should now look like this

```
Y1=X^2
Y2=
Y3=
```

4. Now press [2nd] [DRAW] and press 7 to select shade. The Home screen should now look like this

```
Shade(
```

5. When you enter the area to shade, you have to enter the lower function, followed by a comma, and then the upper function. If the lower function is (X-2) and the upper function is (X^3-8X), then the Home screen should look like this

```
Shade(X-2 , X^3-8X)
```

6. After pressing the [ENTER] button, the area under Y=(X^3-8X) and above Y=(X-2) is shaded.

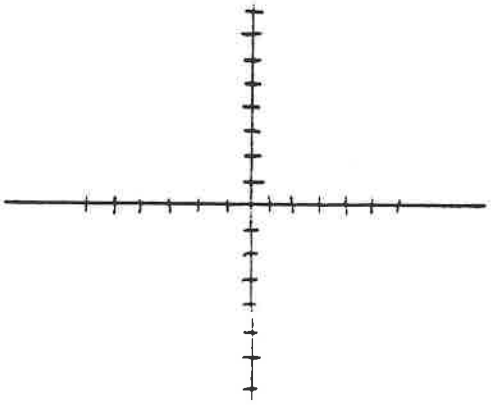
7. Now clear the graph by hitting [ZOOM] and then pressing Zstandard. This will clear the graph so you can try some problems.

Problems

Now try some problems on your own. Make sure you clear your graph, as shown in step 7, before proceeding to the problems.

Problem 1

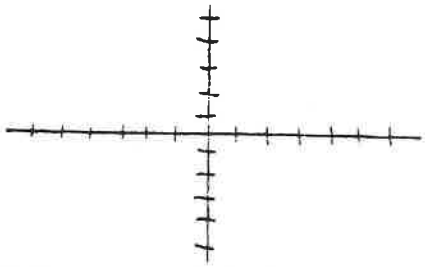
Shade the region under Y=8 and above Y=5



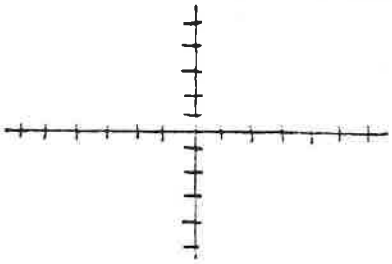
Is it possible to shade the area above Y=8 and below Y=5 in one task?

Problem 2

Shade the region under Y= ^2-1) and above Y=(X^2-4)



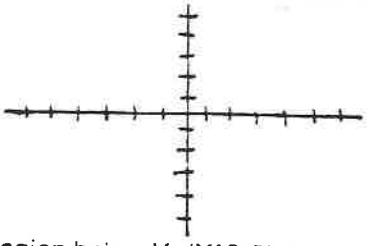
Shade the region under Y=(X^2-4) and above Y=(X^2-1)



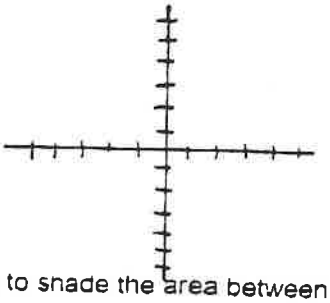
What is the difference between the two? Why is there a difference?

Problem 3

Shade the region below Y=(X^2-4) and above Y=(X^3-8)



Shade the region below Y=(X^3-8) and above Y=(X^2-4)



Summary

It is possible to shade the area between two curves on the Home screen and in the program editor. In order to shade correctly, the lower function must be entered into the Home screen first. If the function order is switched, then the shading could be backwards, as shown in problem three, or no shading could exist, as in problem two.

Meghan Cooney
January 20, 1999

Graphing Equations in the Form $y = a(x-b)^2+c$

The equation, $y = a(x-b)^2+c$, will yield a parabola when graphed. Although it will be easy to graph the equations on your calculator, it is good to know the basic trends when graphing parabolas.

Graphing Calculator: In order to learn how to graph parabolas, you must first be able to use your calculator. Turn on your calculator by pressing the [ON] button. Next go to the rows of buttons right below your screen and press the [Y=] button. Your screen should look something like this:

```
Plot 1   Plot 2   Plot 3
\Y1 =
\Y2 =
\Y3 =
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

-Make sure that none of the plots are highlighted
-You type in the equations next to Y =
-Make sure that all the lines to the left of Y= are straight & solid
-Make sure that all lines are clear

Next, go to the button that says [ZOOM] and press it. You should get a screen that looks like this:

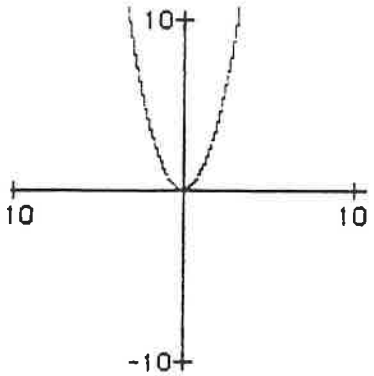
```
ZOOM          MEMORY
1: ZBox
2: Zoom In
3: Zoom Out
4: ZDecimal
5: ZSquare
6: ZStandard
7. ZTrig
```

-Press [6] in order to get the correct Ranges and Domains that are needed to graph the equations.
-Once you press [6], you will get the picture of an empty graph.

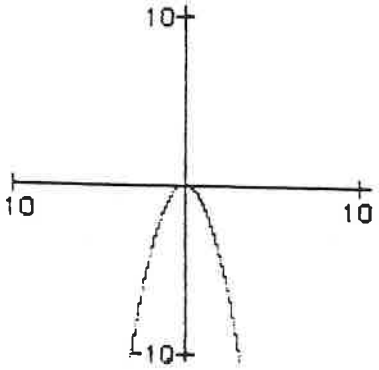
Now go back to [Y=] and type [X,T,Ø,n] and [x^2]. It should look like this:

```
Plot 1   Plot 2   Plot 3
\Y1 = X²
\Y2 =
\Y3 =
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

Press [ENTER] and [GRAPH]
You should get this:

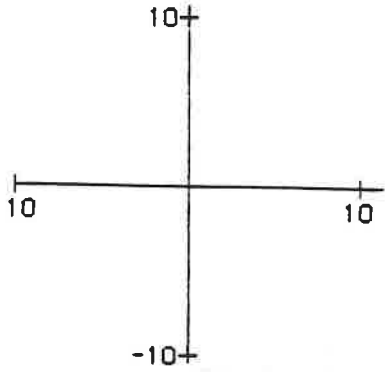


Notice that the vertex is on the origin and the parabola curves upward.
Now go back to Y= and type in (-), X,T,Ø,n, and x^2, making sure that the previous equation is erased.
Press ENTER, then GRAPH. Notice on this graph that the parabola curves downward.
The reason for this is that a = -1.

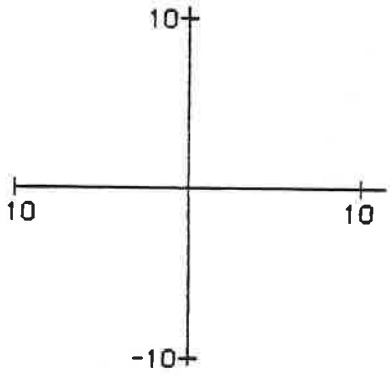


Now graph the following equations on your calculator in groups of three, draw them in the space provided, and then give the description on how each differs from the others. Notice the trends.

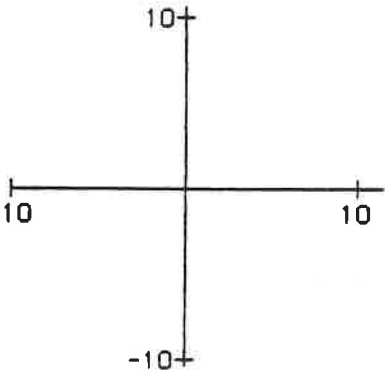
1. $Y_1 = x^2$
   $Y_2 = 2x^2$
   $Y_3 = (1/2)x^2$
   (Notice what happens when "a" increases and decreases.)
Describe:



2. $Y_1 = x^2$
   $Y_2 = (x+2)^2$
   $Y_3 = (x-2)^2$
   (Notice what happens when "b" is positive or negative and where the vertex moves.)
Describe:



3. $Y_1 = x^2$
   $Y_2 = x^2 - 2$
   $Y_3 = x^2 + 2$
   (Notice what happens when "c" is positive or negative and where the vertex moves.)
Describe:



Lee Koliopoulos

Finding Extrema(Maxima and Minima) Using a TI-83 Graphing Calculator

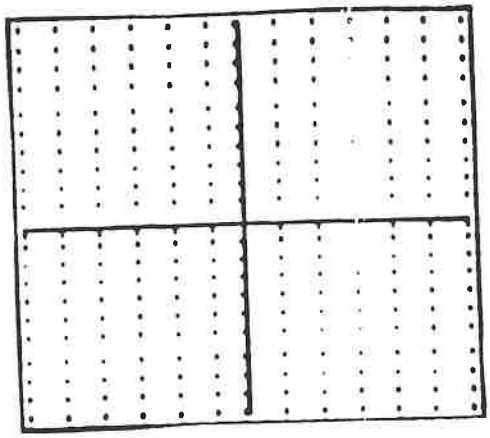
Name:_____ Date:_____

Preparing to Find the Extrema:

Upon turning on the calculator press the **WINDOW** key. It is located upper left hand corner. Set Xmin = -6, Xmax = 6, Xscl = 1, Ymin = -10, Ymax = 10, Yscl = 1, and Xres = 1 before you begin. The screen you look like this:

WINDOW
Xmin=-6
Xmax=6
Xscl =1
Ymin=-10
Ymax=10
Yscl =1
Xres =1

Next press the yellow **2nd** key, located in the upper left hand corner, and then press the **ZOOM** key, located in the upper middle. Make sure everything on the left side is *highlighted*, except you want **GRID ON** highlighted.
Next hit the **GRAPH** key in the upper right hand corner. The screen should look like this:



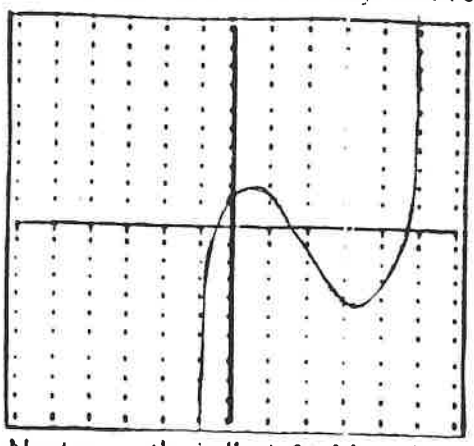
Finding the Extrema:

Hit the **Y=** key, located in the upper left hand corner. The screen should then say Y1=, Y2=, Y3=, and so on down the left side. Next to **Y1=** place the function you wish to find the maxima and minima of. For example, let's use the curve:

$$y = x^3 - 5x^2 + 4x + 2$$

Enter it next to **Y1=** on the screen.
(To enter the x-variable into the calculator press the **X,T,O,n** key)
(To raise a variable to a power, press the ^ key, located on the right hand side, and then press the number you wish to raise the variable to.)

Next press the **GRAPH** key. The screen should look like this:



Next press the yellow **2nd** key, located in the upper left hand corner, and then press the **TRACE** key, located in the upper right. To find the local minimum choose **3:minimum**. To find the local maximum choose **4:maximum**.

Let's find the local maximum together.

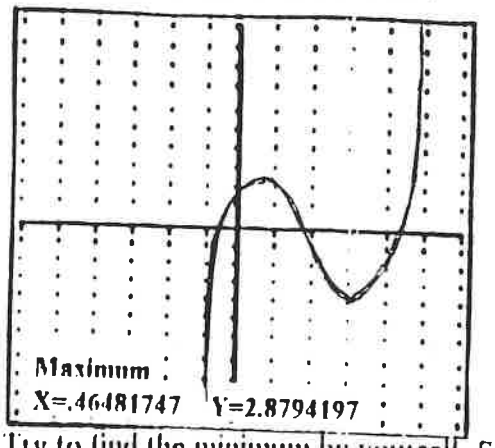
1). After choosing **4:maximum**, the calculator will go to the graph screen and ask you for a *"Left Bound."* Move the cursor, using the arrows in the upper right hand corner of the calculator, to the **left** of the point that you believe to be the maximum. Press the **ENTER** key.

2). Now the calculator will ask for a *"Right Bound."* Move the cursor to the **right** of the point that you believe to be the minimum and push **ENTER** again.

3). Now the calculator will ask for a *"Guess"*. Move the cursor to the point that you believe to be the maximum and push **ENTER**.

You should get **X=0.46481747 Y= 2.8794197** at the bottom of the screen. This is the point of the maximum.

The screen should look like this:



Try to find the minimum by yourself. Start the same way, by pressing the yellow **2nd** key, located in the upper left hand corner, and then press the **TRACE** key, located in the upper right. To find the local minimum choose **3:minimum**. **Good Luck!**

The answer for the minimum is **X= 2.868516 Y= -4.064605**

DY/DX

Karen Kasza 1999

Name:
Date:

Purpose: To find the Derivative of a line from the "Calc" Menu of the TI-83

The Derivative

What is a Derivative? The Derivative is the slope of a line or the slope of the line tangent to a curve at a point on that line. It is used in calculus to find the rate of change at a specific value of a function. It can be denoted dy/dx as in the calculator, f '(x), or simply y'. All of these notations mean the change in y with respect to the change in x.

How do we find the Derivative? The method of finding the derivative is derived from Fermat's difference quotient $f'(x)=\lim_{h\to 0} [f(x+h) - f(x)]/ h$. However, the value of the derivative can quickly and easily be found using your graphing calculator.

How to Find DY/DX on the T1-83

Step 1: Turn on calculator with [On] button

Step 2: Press [Mode] key and make sure that all of the choices on the menu to the furthest left are highlighted. If not, use left and right arrows to move cursor.

Step 3: Press [Zoom] button and press the number "6" to select the "ZStandard" mode.

Step 4: Press the [Y=] key. Use the [Clear] button to clear out any old entries on the screen. Move your cursor next to $\backslash Y_1 =$. Enter the equation of the line or curve of which you wish to find the derivative.

Step 5: Press the [Graph] key to display the graph of your equation.

Step 6: To find dy/dx, press [2nd] key them the [Trace] key to display the "Calc" menu. Press "6" to select the dy/dx option. The graph of your function will appear again. Enter the x value of the point at which you want to find the derivative and press the [Enter] key.

Step 7: In the bottom left corner of the graph screen, the derivative value is displayed in the form dy/dx=the derivative at that point of the equation.

Let's Find Some Derivatives

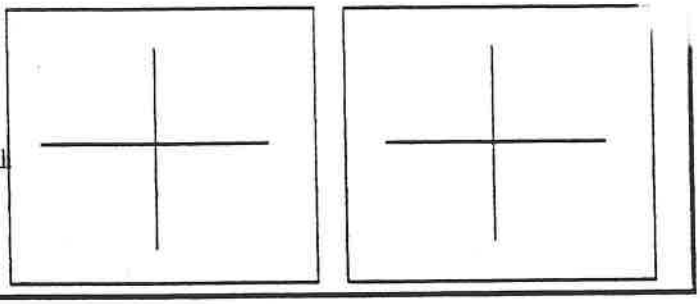
1.

y = 4x-3

1) In Box 1, graph this equation from the graph displayed in *Step 5* of the directions.

2) Find the derivative at x=0,3, and -1 using the directions. dy/dx= _____ Notice they are equal

3) Set the derivative values you have just found = to y. This forms a line y=4.



In #1, we find that the derivative of a straight line is constant and equal to the slope *m* of the line in the y=mx+b form. m=dy/dx=4. When you set y=4, you are graphing the derivative of the line. Because y=4x-3 is a straight line, the slope (rate of change) is constant, and when we graph the derivative, we find a horizontal line. This shows that the slope does not change.

2.

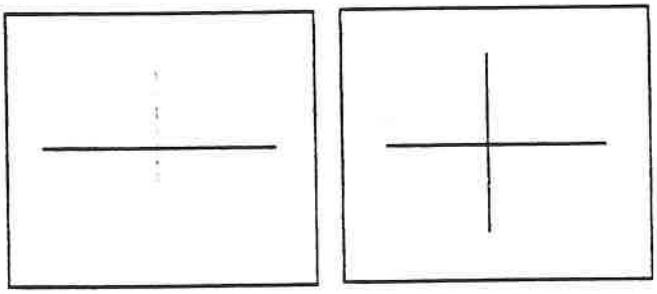
$y=x^2$

1) Graph this equation in Box 1.

2) Find the derivative using your calculator at x=1. dy/dx= f '(1)= _____

3) Find the derivative at x= -1. f '(-1)= _____

4) Using Fermat's Method, we find that in general f(x)= 2x. Graph this equation in Box 2. Check to make sure the values which you found on your calculator for f '(1) and f '(-1) are on this curve.



$y=x^2$ is the graph of a parabola. f'(1)=2. This is a positive rate of change. The y values are increasing. f'(-1)=-2. Here, the rate of change is negative and the y values are decreasing. The graph of the f'(x) of a parabola is a straight line. This means that the slope of the parabola is increasing at a constant rate.

3.

Find dy/dx on your calculator.

$f'x=x^2+2x+1$ at x= -1 **y=|x| at x=0** **$f'x= 4-x^2$ at x=2**

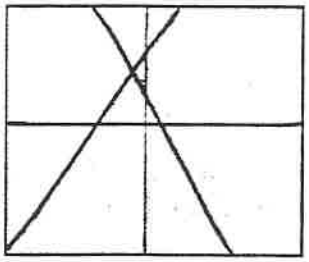
f'(-1)=0. The tangent line is horizontal and the slope is 0.
f'(0) is undefined when graphs come to sharp corners as in absolute value graphs.
f'(2) is undefined when the line tangent to the curve is vertical. It has no slope.

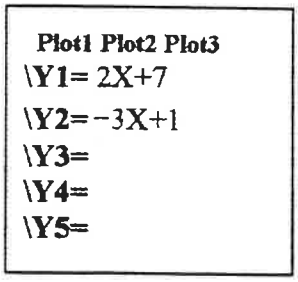
Ronnie Faber
January 20,1999

Intersections of Equations

Purpose: To use the intersect function on your calculator to find the point of intersection of two lines.

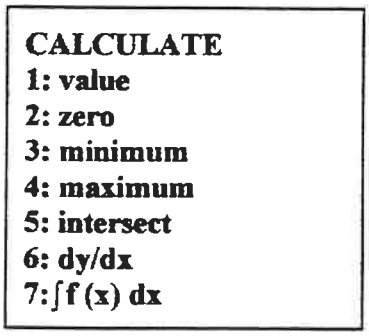
① Once the calculator is on, you need to put the two equations into your calculator. To do this push the [Y=] key on your calculator. You now want to enter your equations. As an example type in 2X+7 next to Y1= and -3X+1 next to Y2=. Your screen should look similar to the picture to the right.

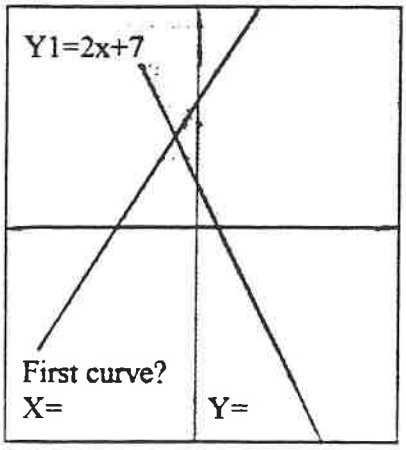




② Now hit the [GRAPH] key. The calculator will now graph the two equations. You will also see that they intersect at one point. The graph is shown to the left.

③ In order to find the exact point where the lines intersect you must go to the calculate menu. This is located by hitting the [2nd] key and then the [TRACE] key. The menu will appear and will look like the picture to the right. Move your cursor down to 5:intersect and hit [ENTER].

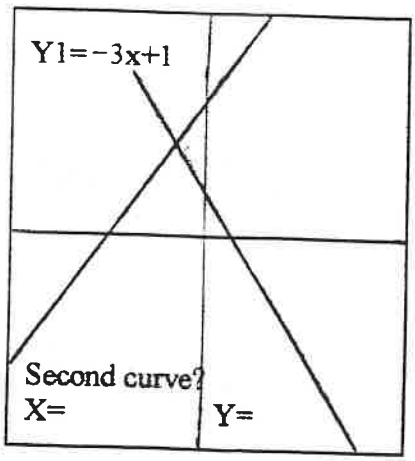


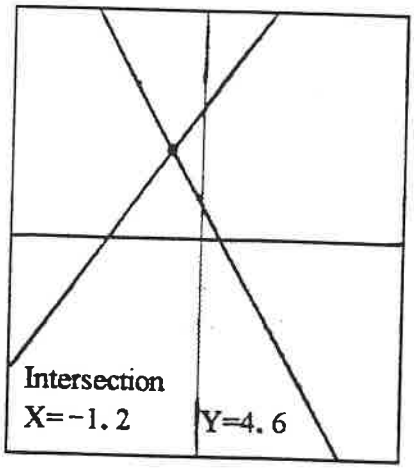


④ The graph will reappear on the screen, but now the bottom of the screen reads 'First curve?'. And the upper lefthand corner will have one of your two equations listed. The cursor will be blinking on a point of that line. Move the cursor by using the left and right arrow keys to a point where it is close to the intersection and hit [ENTER].

⑤ Now the bottom reads 'Second curve?' and the top should list your other equation. Again move the cursor to a point near the intersection and hit ENTER.

*Note: If you need the cursor to move to the other line use the up and down arrows.

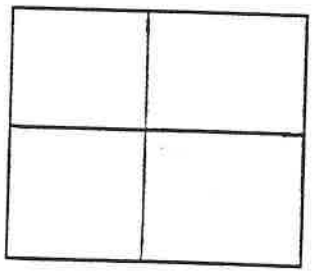




⑥ Now it will ask you to 'Guess?' To guess move your cursor over the point where you think the intersection is located and hit ENTER. If you don't want to guess just hit the ENTER key. The screen will now read intersection and underneath it will tell you the X and Y coordinates. For this example it tells us that the point of intersection is at X=-1.2 ; Y= 4.6.

Now try these on your own. Sketch each of the equations on the graph provided. Round all answers three decimal places.

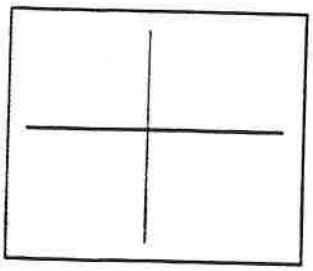
①Y1= $\sqrt{(2x+3)}$
Y2=$(x+2)^2 + 6$



X=_____

Y=_____

② Y1=5
Y2=2 $(X)^2$ - 5



X=_____ X=_____

Y=_____ Y=_____

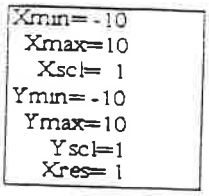
*Note there are two intersections. Find them both using the same method twice.

Aimee Gloude
1/20/99

Using the TI-83 to find the point of intersection of functions.

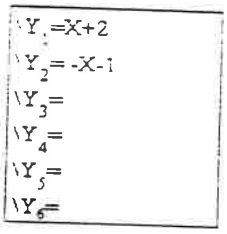
The TI-83 can be used to find the coordinates of a point where two or more functions intersect.

Step 1: Check the window on the graph. To do this, press WINDOW. Make sure your sceen looks like this:

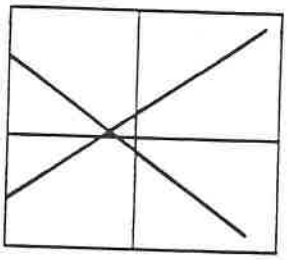


***Note**: Sometimes you will have to change the window in order to see where the graph intersects.

Step 2: Use the Y= button to enter the equations into the calculator. For this example enter Y_1=X+2 and Y_2= -X – 1. So your screen looks like this:



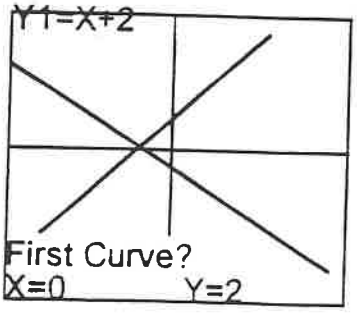
Step 3: Press GRAPH. Your screen should look like this:



Step 4: To find the intersection use the CALC menu, to do this

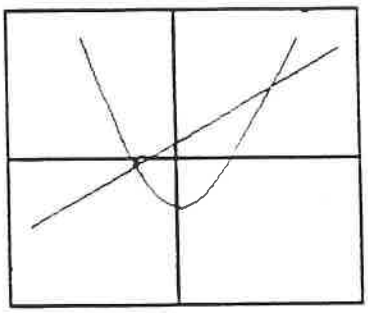
1.) Press 2nd TRACE. You should see a list of calculator functions.

2.) Choose **5:intersect**. Your graph should look like this:



Step 5: The calculator is asking if the cursor (the blinking X) is on the first curve, it is, so press ENTER.
*Note: Sometimes, if there is more than one intersection point, the cursor will have to be moved, to do this use the arrow keys to move it to the right spot.
Step 6: The calculator now askes for the second curve, the cursor should be on the other line. Press ENTER.
Step 7: Now the calculator asks you to "guess". Move the cursor to where it looks like the functions intersect and press ENTER. You should get the intersection to be X= -1.5 Y=.5

Press Y= .Clear the old equations. Now enter two new equations: $Y_1 = .5X^2 - 2$ $Y_2 = X+2$
Press GRAPH Your graph should look like this:



Like before, press 2nd TRACE to get to the CALC menu and choose **5:intersect**.
This time there are two interseting points. First we will check the point on the left.
To do this, we have to move the cursor closer to the intersecting point, but not on the intersecting point.
Use the **blue arrow keys** to move the cursor.
Press ENTER for the first curve when the cursor is in the right spot.
Again, for the second curve, move the cursor closer to the intersection and press ENTER.
Place the cursor on where the functions appear to intersect and press ENTER when the calculator asks you to "guess". You should get the intersection X= -2, Y=0
To get the second point of intersention, go back to the CALC menu and choose **5:intersect**.
This time, we have to move the cursor to the right, closer to the other intersecting point.
Use the **blue arrow keys**.
For the first curve, press ENTER when the cursor is close.
Again, for the second curve, move the cursor closer to the intersecting point on the other line, but not on the point. Press ENTER.
To "guess" put the cursor on where it looks like the functions intersect and press ENTER
You should get the intersection at X=4, Y=6.

Try these on your own:

1.) $Y_1=X^3+3X^2-3X-2$
$Y_2=3X+8$

2.) $Y_1=X^4+2X^2-3X-1$
$Y_2=-X^2+5$

Maneesh Sud
January 20, 1999

Integration on the Calculator (TI-83)
—No Graphing Required—

Purpose: This worksheet explains how you can integrate on the calculator without having to graph the function first. This method involves using the function ***fnInt(*** under the menu **MATH**.

Integration is the mathematical method of determining the area under a curve over a given interval. Integrals are represented by the following form:

$$\int_a^b (f(X))\, dX,$$

where ***a*** is the lower limit of the integral (the starting point of your interval), ***b*** is the upper limit (the ending point of your interval), and ***f(x)*** is the equation of the curve. When evaluating integrals by hand, one must find the anti-derivative of f(x), represented as f*(x), then subtract f*(a) from f*(b). Using the calculator, however, is much simpler (who wants to do it the hard way?), as the following directions demonstrate.

Directions: Under the menu **MATH**, select the function ***9: fnInt(***. This will bring you to the main screen. After the ***fnInt(***, type in the equation of your function, a comma, the variable of your function (usually *X*), a comma, your lower limit, a comma, your upper limit, and a right parenthesis. Then press **ENTER** to evaluate the integral. The following example should clear up any confusion.

Example: Find the area under the curve $y = 3X + 1$ from $X = 3$ to $X = 4$, represented by the following integral:

$$\int_3^4 (3X + 1)\, dX.$$

Step 1: Press **MATH**;

Step 2: Select ***9: fnInt(***;

Step 3: Press **3**, then press **X,T,Ø,n**, then press **+**, then press **1**;

Step 4: Press **,**;

Step 5: Press **X,T,Ø,n**;

Step 6: Press [,] ;

Step 7: Press [3] ;

Step 8: Press [,] ,

Step 9: Press [4] ;

Step 10: Press [ )] ;

Your screen should read the following: ***fnInt(3X+1,X,3,4)***

Step 11: Press **ENTER** .

You should get ***11.5*** as an answer. Simple, isn't it?

Sample Problems:

1. Given the curve $y = X^2$ from $X = 1$ to $X = 5.5$, fill in the following values:

   Equation:_____ Variable:_____

   Lower Limit:_____ Upper Limit:_____

   Area under curve:_____

2. Evaluate the following integral:

$$\int_{2}^{6} (X^3 + 1)\, dX$$

   Answer:_____

3. Evaluate the following integral:

$$\int_{3}^{3} (14X^2 + 3X + 1)\, dX$$

   Answer:_____

4. Evaluate the following integral:

$$\int_{1/4}^{1/4} (14X^2 + 3X + 1)\, dX$$

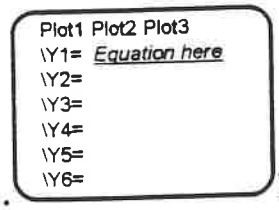
   Answer:_____

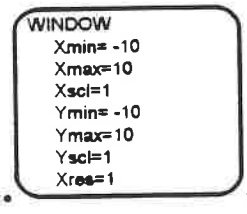
GOOD WORK!!!

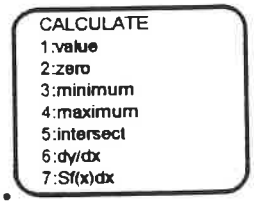
NAME_____
DATE_____

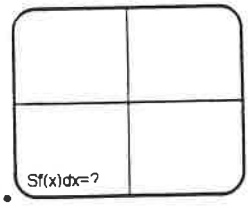
USING THE INTEGRAL FUNCTION WITH A GRAPH

The integral of a function can be used to determine the area under the curve of the graph of that function. The integral function can be found under the **CALC** menu on your calculator. To use this function, follow these easy steps. First, enter the equation of the function under the **Y=** menu. Refer to picture #1 to make sure you are in the right place. The equation is what follows the integral sign and before the dx. For example, $\int_1^3 3x^2 dx$, the equation of the function would be $Y= 3x^2$. Next, press the **GRAPH** button to display the graph. ***Note: Make sure your window is the right size to ensure you will be able to see your graph clearly. To check, press the WINDOW button. Common window settings are shown in picture #2. Now press GRAPH to display your graph again.*** With the graph on the screen, press **2nd** and then **TRACE** to access the **CALC** menu. Refer to picture #3 to see if you are in the right menu. Select function 7: Sf(x)dx by pressing the 7 key. It will ask you for a lower limit. Type in the number found below the integral sign and press enter. Now, it will ask for an upper limit. Type in the number found above the integral sign and press enter. You will find your answer at the bottom of the screen as shown in picture #4.

1.


2.


3.


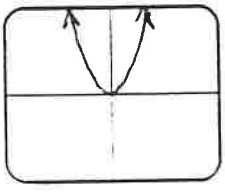
4.


Here is an example for you to try:

FUNCTION

$\int_1^3 3x^2 dx =$

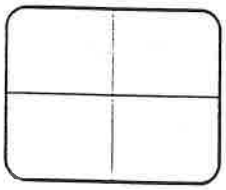
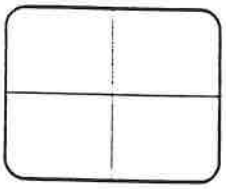
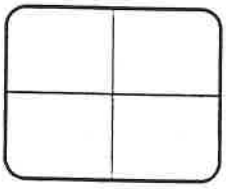
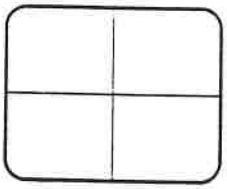
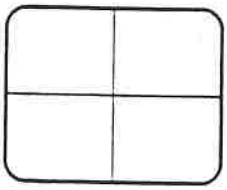
GRAPH



SOLUTION

26

TRY THESE ON YOUR OWN FOR PRACTICE.

	FUNCTION	GRAPH	SOLUTION
1.	$\int_{2}^{4} 4x^3\,dx =$		_____
2.	$\int_{0}^{2.5} 2x^4\,dx =$		_____
3.	$\int_{1}^{3} (2x-x^2)\,dx =$		_____
4.	$\int_{0}^{\pi/2} \sin(2x)\,dx =$		_____
5.	$\int_{-2}^{1} (x^2+3x-5)\,dx =$		_____

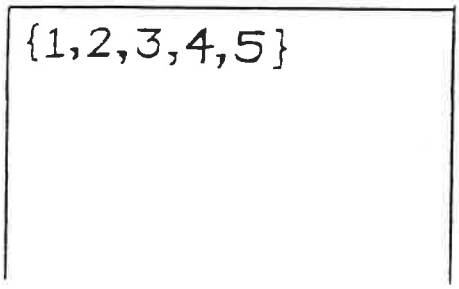
Created by Brian Ladewig

Lahna Thomas
January 20, 1999

LISTS WORKSHEET

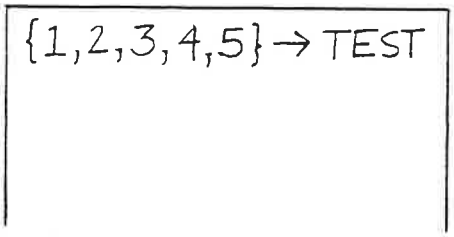
Creating and Naming a List on the Home Screen

1. Press 2nd [{], and then enter one or more numbers to make up the list, separating each number with a comma. Then press 2nd [}].

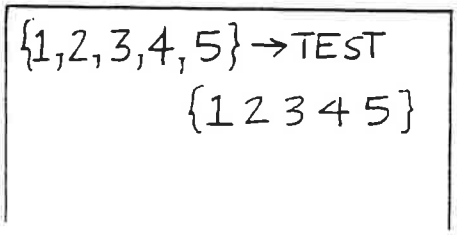


2. Press STO→

3. Press 2nd ALPHA and enter the name of the list.



4. Press ENTER. The list is displayed on the next line and the name and numbers are stored in memory.

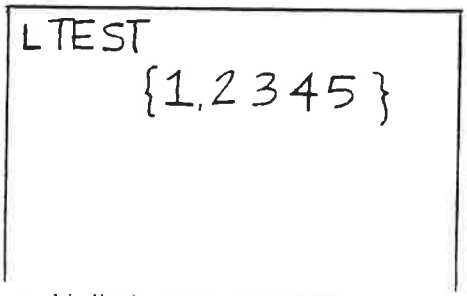


Practice: Enter a list with the elements 1, 2, 3, 4, and 5 in it. Then store the name of the list.

Displaying a List on the Home Screen

1. Press 2nd [LIST] > to display the LIST OPS menu.

2. Highlight B: L and press ENTER, then enter list name.



OR

1. Press 2nd [LIST]. Each item on this list is a user-created list.

2. Highlight the desired list name and press ENTER.

Practice: Clear the home screen and try to recall the list by the name under which it was just stored.

Using a List in an Expression

1. We will use the example expression 20/x.
2. Clear the home screen and enter 20, then /.
3. Use the rules for *Displaying a List* to enter the list you just stored after /. It should look like this:

4. Press ENTER and the answers for this expression for each number in the list will appear in corresponding order.

OR

1. Enter 20, then /.
2. Press 2nd [{] and enter numbers in a list, separating each with commas. Then press [}].
3. Press ENTER to display answers.

The LIST OPS Menu

To display the LIST OPS Menu, press 2nd [LIST] >.

1: SortA(	Sorts lists in ascending order
2: SortD(	Sorts lists in descending order
3: dim(	Sets the list dimension
4: Fill(	Fills all elements with a constant
5: seq(	Creates a sequence
6: cumSum(	Returns a list of cumulative sums
7: List(	Returns difference of successive elements
8: Select(	Selects specific data points
9: augment(	Combines and puts 2 lists in numerical order
0: List>matr(	Stores a list to a matrix
A: Matr>list(	Stores a matrix to a list
B: L	Designates the list name data type

Mary Jo Przytula
January 20, 1999

THE FORMAT KEY

PURPOSE: To demonstrate the function and use of the format key on the TI-83 calculator.

DIRECTIONS: Before beginning the worksheet your window must be set to the following dimensions. To do this simply hit the window key (the second blue button from the left on your calculator.) and set it to the following settings:

Xmin=-10
Xmax=10
Xscl=1
Ymin=-10
Ymax=10
Yscl=1
Yres=1

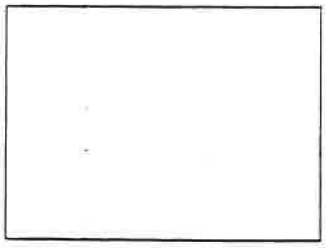
After setting the window hit the yellow 2nd button and then the button directly to the right which will exit you from the window menu. Before working with the format key hit the Y= button (the first blue button on the top). You will enter the Y= menu. For Y1= type in Y1=X. The X key is directly to the right of the green alpha key) Hit the yellow 2nd button and then the key to the right of it to exit the menu.

The Format Key. The format key is the second function of the zoom button on your calculator (the third blue button on the top of your calculator). To enter the format menu simply hit the yellow 2nd button and then the zoom button. For the first graph make sure that all the menu items on the left are highlighted. To highlight an item use the cursor keys to select the item and then the enter key to highlight it.

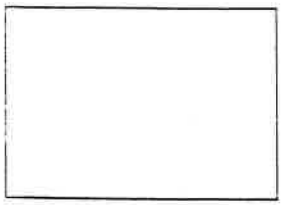
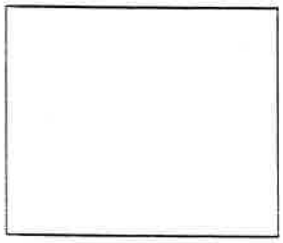
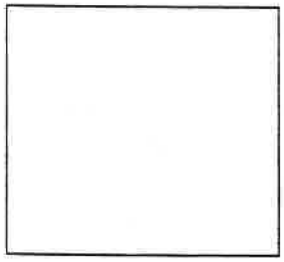
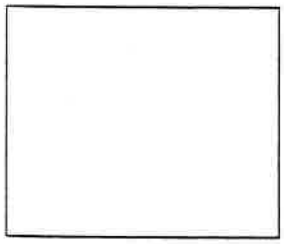
REFERENCE GRAPH

Make sure all items on the left are highlighted. Hit the graph key.

Draw the graph in the space provided.



From this graph you will compare and contrast the following graphs. Only the highlighted sections of the format key will change.

HIGHLIGHTED ITEMS	GRAPH	COMPARISON
All items on the left and the CoordOff. Hit the graph key.		
All items on the left and the GridOn. Hit the graph key.		
All items on the left and the AxesOff. Hit the graph key.		
All items on the left and the LabelOn. Hit the graph key.		

The last two menu items that were not compared are rather difficult to compare with simple graphs. To show how these functions work, highlight all the items on the left Highlight the PolarGC item on the right and hit the graph key. Notice the difference in the X and Y coordinates on the bottom of the graph. Highlight all the items on the left. Hit the graph key and then the trace key (the fourth blue key on the top of your calculator) If you move the cursor you will notice that the equation for the line you are tracing will appear in the upper left corner of your graph. Now go back into the format menu and highlight the ExprOff. Hit the graph key and then the trace key. As you move your cursor you will notice that there is no equation in the upper left corner. That concludes the functions of the format key. Have fun, and happy calculating.

Joe Benjamin
January 20, 1999
The Program Function
Purpose: To learn how to use the program function on the TI-83 calculator.

To program equations into the TI-83:

Press **PRGM** key
Press right arrow key twice to highlight **NEW**
Press **ENTER** or **1**

Using keypad, type in a name for your program.
Press **ENTER**

Type in the equation that you would like programmed
For example: y=mx+b

Note: to type in letters, you must first press **2nd** and then **ALPHA**
After typing in the equation, press **2nd** and the **MODE** button to quit.

To get into a program already in your calculator:

Press **PRGM**
Move the right arrow over once to highlight the word **EDIT**
Press the number of the program.

Chad Bareither

Calculator Link: Transmitting & Receiving Programs on the TI-83

Purpose: To transmit a program from one calculator to another.

Materials: 2 TI-83 calculators & 1 calculator Link Cable

Procedure: Turn both calculators on and plug one end of the Link Cable into the outlet at the bottom of both calculators. Go to the Link menu on both calculators by invoking the 2nd command, then pushing the Link button located in the upper left region of the calculator. Your screen should look like this:

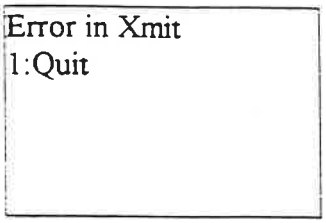
```
SEND  RECEIVE
1:All+...
2:All-...
3:Prgm...
4:List...
5:Lists to TI82...
6:GDB...
7:Pic...
```

On the calculator containing the program(s) which you desire to transfer scroll down to #3[Prgm] using the arrow keys and hit ENTER. Your screen should now display "SELECT" and "TRANSMIT" across the top of your screen followed by a list programs the calculator contains. Scroll down the list of programs and hit ENTER to select the progam(s) you wish to send. After you have made your selections move to the right using the arrow keys, "TRANSMIT" should now be highlighted on the top of your screen and there should be a #1 Transmit option underneath with the number also highlighted. Wait there while you prepare the other calculator.

On the calculator which is to receive the program(s) scroll to the right using the arrow keys so that you highlight the "RECEIVE" menu at the top of the screen. There should be one option underneath, 1:Receive, hit the ENTER key and then your screen should display "Waiting..." across the top of the screen.

The last step is to move back to the first calculator , you should still be in the "TRANSMIT" menu, and hit the ENTER key to begin the transfer. The calculator sending the program(s) will begin to display the programs that are being transmitted and then display "Done" when the process is complete. Similarly the calculator receiving the programs will display "Receiving..." across the top followed by the list of program(s) and "Done" when the operation is complete.

Reasons For Error: If one or both of the calculators display:



Hit ENTER to quit the transfer and then be sure of two things 1) the Link Cable is pushed all the way into the outlet 2) both calculators are TI-83's, a different process is needed in this case. If the problem still occurs there may be an error in the program you are transferring. Be sure you can still run the program on your own calculator.

LINKING TI-83'S

By Tom Etlinger

1. Insert each end of the linking cord into the hole at the bottom of the calculator. See figure 1.

Figure 1

2. Turn both calculators on by pressing the **on** button.

3. On both calculators go to the linking table by pressing ***2nd*** and then ***link.***

4. On the receiving calculator press ▶ and then ***enter***.

5. On the sending calculator. scroll down (using ▼) to the menu that includes what you want to send and press ***enter***. (By pressing ***All+*** you can send all files: ***All-*** lists all files and deselects them.) See figure 2.

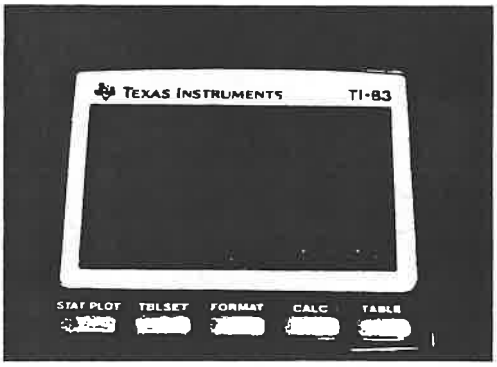


Figure 2

6. Scroll down to the file you want to send and press ***enter***. This will select that file.

7. Continue this process till you have selected those files that you want to send. Pressing ***enter*** a second time will deselect the file. See figure 3.

8. Press ▶ and then ***enter.***

9. ***For Example:*** To send the program "Math",

   1. Connect the two calculators.
   2. Press ***on*** on both calculators.
   3. Press ***2nd*** and then ***link*** on both calculators.
   4. On the receiving calculator press ▶ and then ***enter***.
   5. On the sending end, scroll down (using ▼) to the menu **3:Prgm...** and press **enter**.
   6. Scroll down to "**Math**" and press **enter**.
   7. Press ▶ and then ***enter.***

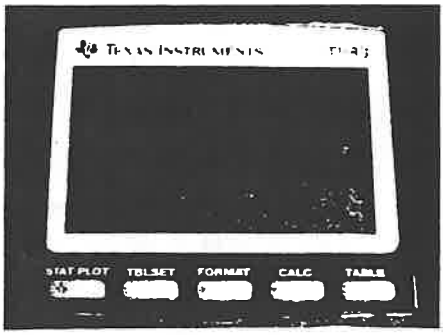


Figure 3

Lauren Kral 1999

Name:
Date:

Fractions to Decimals & Decimals to Fractions

Purpose: To learn a new way to change fractions to decimals, and decimals to fractions on the TI-85

Fractions to Decimals
Read all the way through before pressing anything

- Press [ON] in the lower left hand corner.
- Press [2nd] in the upper left hand corner.
- Press [BASE], which is also the "1" key. You should see

A-F	TYPE	CONV	BOOL	BIT

on the bottom of your screen.

- Press the button directly below [CONV] : [F3]. Now you should see

A-F	TYPE	CONV	BOOL	BIT
►Bin	►Hex	►Oct	►Dec	

on the bottom of your screen.

- Type in 5/8
- Now press the button directly below [►Dec] : [F4]. You should see on screen:
  5/8►Dec
- Press [ENTER]. The correct answer is .625

Now try a few on your own.

17/18= 24/27=

499/500= 15/18=

- In order to clear the screen, press [CLEAR], [EXIT], [EXIT]

Decimals to Fractions

- Press [2nd] in the upper left hand corner

- Now press [MATH], which is the same key as the multiplication sign (x). You should see

NUM	PROB	ANGLE	HYP	MISC►

on the bottom of your screen.

- Press the button directly below [MISC] : [F5]. Now you should see

NUM	PROB	ANGLE	HYP	MISC
sum	prod	seq	lcm	gcd►

- Press the [MORE] button, located in the top of the middle row of buttons. Now you should see

NUM	PROB	ANGLE	HYP	MISC
►Frac	%	pEval	∛	eval

- Type in .125

- Press the button directly below [►Frac] : [F1]. You should see: .125►Frac

- Press [ENTER] in the lower right hand corner. You should see 1/8 on the screen, which is the correct answer.

NOW TRY THESE

.525=

644=

.963=

.250=

Sunil Chopra

Name:
Date:

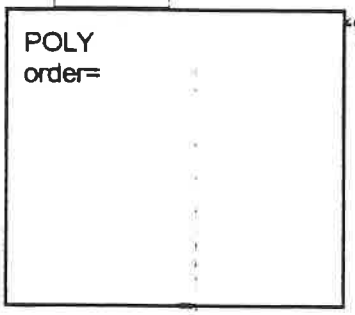
Finding Zeros With the TI-85

A zero is the x-coordinate on a graph at which the curve intersects the x-axis, making y = 0.
The "Poly" function on the TI-85 will help you find zeros without graphing.
We'll use the polynomial equation y=x^4-8x^2+16 as an example.

STEP 1 — Press ON

STEP 2 — Press 2nd and POLY
PRGM

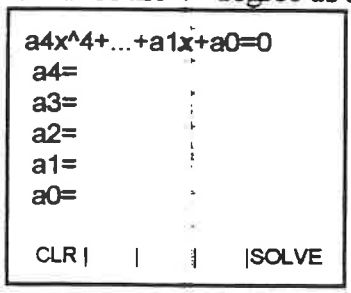
This screen should appear:



"order" means the degree or highest exponent in a polynomial.

STEP 3 — Press 4
and ENTER

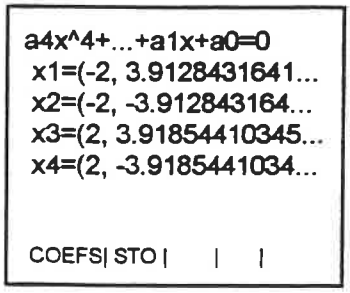
We're going to use a polynomial of the 4th degree as an example.
This screen should appear:



The top line "a4x^4+...+a1x+a0=0" is a generic representation of a 4th degree polynomial. "a4" is the coefficient for the term for x^4. "a3" is representative of the coefficient for x^3, and so on.

STEP 4 — Enter 1, followed by ENTER, 0 and ENTER, -8 and ENTER, 0 and ENTER, and 16 and ENTER. Then press F5, for SOLVE on the menu.

The calculator will work for a few moments and then this screen should appear:

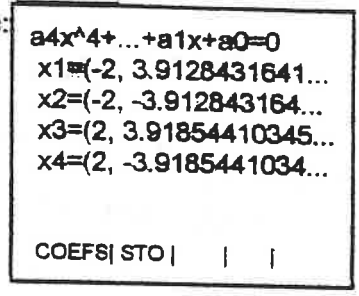


The x1's and x2's, etc., are the zeros. Here we have four zeros. You can scroll down the numbers with "..." by using your arrow keys. If you scroll down each of the x's, you'll find that the number after the commas (the imaginary number) is very small. It is multiplied by 10 to the -7 power. This makes the imaginary part of the answer small enough to be nothing. So the zeros for this polynomial are x = 2, x = 2, x = -2, and x = -2.

You can use the equation y1 = x^4-8x^2+16 as a graph and see that the curve intersects the x-axis at x = 2 and x = -2.

STEP 5 (optional) — You can store the zeros that you discover by moving the cursor up and down until you land on the answer of your choice and pressing STO>.

As an example, move the cursor over to "x1 =" as shown here:



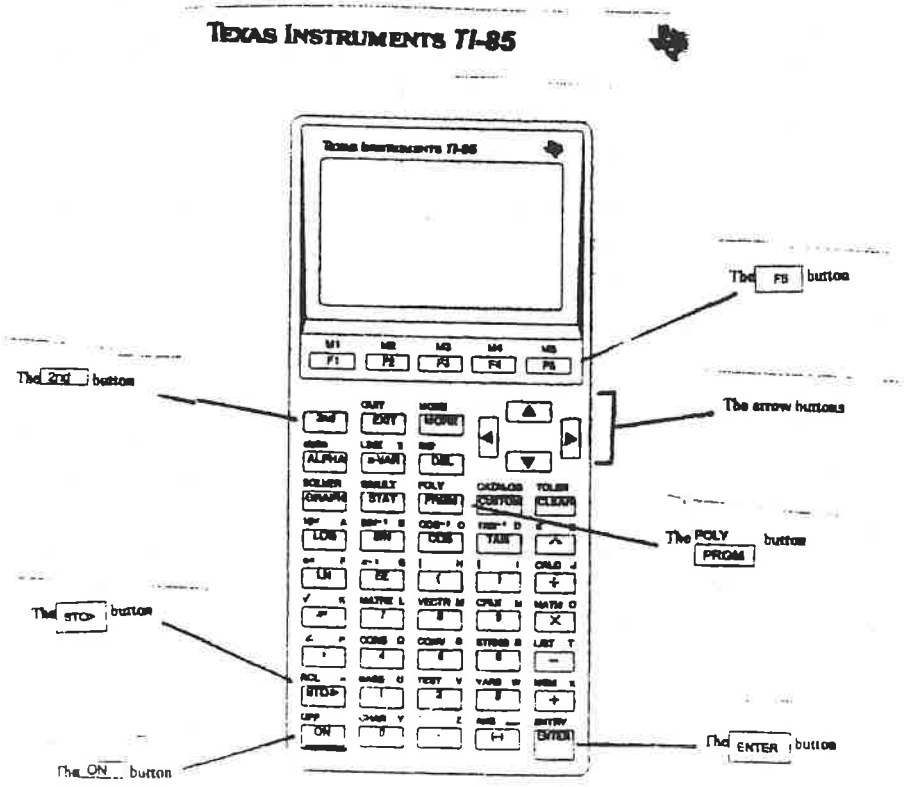
Now press STO>. When the flashing A appears, type "x" and press ENTER. Now if you press EXIT, you can type in "x" and press ENTER and your answer for "x1 =" will appear.

Here are some practice problems that will help you to better use and understand this function of the TI-85.

1. What are the zeros for x^2+7x+10?

2. What are the zeros for x^3-2x^2-5x+6?

3. What are the zeros for x^5+x^4-13x^3-13x^2+36x+36?



Mimi Serirodom

1-16-99

How to Integrate Using a TI-85

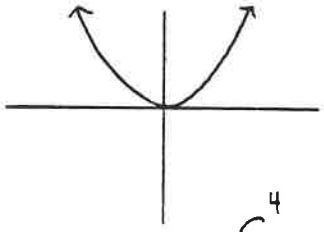
Purpose: To show step by step how to evaluate integrals or to find the area under a curve.

*Suppose you wanted to visually see the curve first.

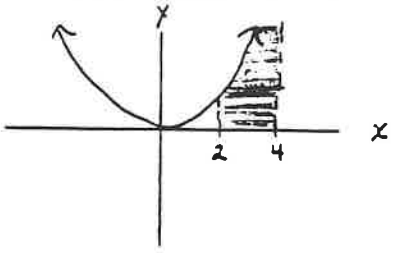
Step 1: Turn on the calculator, press GRAPH to see a list of categories on the bottom of your screen: y(x)= Range Zoom Trace Graph , Press F1 which corresponds to the y(x)= category.

Step 2: Your screen should show : y1 = with the cursor blinking right after it. Enter in the equation of the curve. If your integral looks like this : $\int_2^4 x^2\,dx$, your equation is $y=x^2$ Type in x by pressing X -VAR , then press x^2 to square it.

Step 3: Press GRAPH again to see the list of categories again, and this time press F5 which corresponds with Graph category on the bottom of your screen. The curve should look like this.



*Let's look at the integral again: $\int_2^4 x^2 dx$. The 2 and the 4 tell you which part under the curve to find the area of. The 2 and 4 are x values. This means you need to find the area under the curve from x=2 to x=4



*So now that you know how the curve looks like and what part under the curve to find the area of, let's calculate the area!

Step 4: To clear the screen, press 2nd then EXIT.

Step 5: Press [2nd] then the [CALC] button. You should see a list of categories on the bottom of the screen : [eval F | nDer | der1 | der2 | fnInt]

Step 6: Press [F5] to choose the fnInt category. Your screen should show: fnInt(

Step 7: Type in the equation, a comma, x, a comma, the lower limit of the integral, another comma, the upper limit of the integral, then close with a parenthesis. Press [ENTER] to get the area. So for our integral $\int_2^4 x^2 dx$ we should type in fnInt (x^2,x, 2, 4) press [ENTER] and the area is 18.6666

Step 8: Practice with this example: $\int_0^2$ 3-2x dx, your answer should be 2. Start with Step 4 if you do not want to see the curve first.

Sum and Products of Numeric Sequences

Dankim.

Purpose: To teach those students with a TI-85 how to use their graphing calculator to solve sums and products of numeric sequences. To teach students what a sequence is, and to familiarize students with sigma notation.

Directions: Make sure that your calculator is a TI-85. Turn on your calculator by pressing the bottom left button. Press [2nd] [Math] On the bottom of the screen, five boxes should appear with:

NUM	PROB	ANGLE	HYP	MISC→

Then, hit [F5] . You should then see at the bottom of your screen:

sum	prod	seq	lcm	gcd→

To find the sum or product of a numeric sequence, you need to follow a certain pattern to receive an answer.

Suppose the problem reads	$\sum_{x=1}^{4} 2^{(x-1)}$.	The notation is	$\sum_{(x=\text{lower})}^{(\text{upper})} (\text{expression.})$

The 4 represents the highest value of n, and 1 represents the lowest value of n. In this sequence, you will plug in numbers 1 through 4 into the expression(2^(x-1)) to get the value of the sum of the sequence. The TI-85 can do this for you though. To evaluate the expression, you need to press:

sum	seq(	equation,	variable(used in equation),	lower number,	upper number,	increment)

(NOTE: only the sum and sequence buttons are on the calculator at the bottom of the screen. Everything else needs to be plugged in. The boxes here only represent the different parts needed for the calculator to solve the problem.)

INCREMENT: the distance between numbers. For example, 1 is an increment when counting "1,2,3,4..." 2 is an increment when counting "2,4,6,8..." Most sequence sum problems will be in 1 increments.

For example, the problem at the top would be plugged into the calculator as...

sum seq(2^(x-1), x, 1, 4, 1).

It is important to include the comma(,) between each part for the calculator to solve the problem.

Answer the following problems for practice.

1.) $\sum_{2}^{4} (4x-2)$

2.) $\sum_{1}^{10} (4(x-1))$

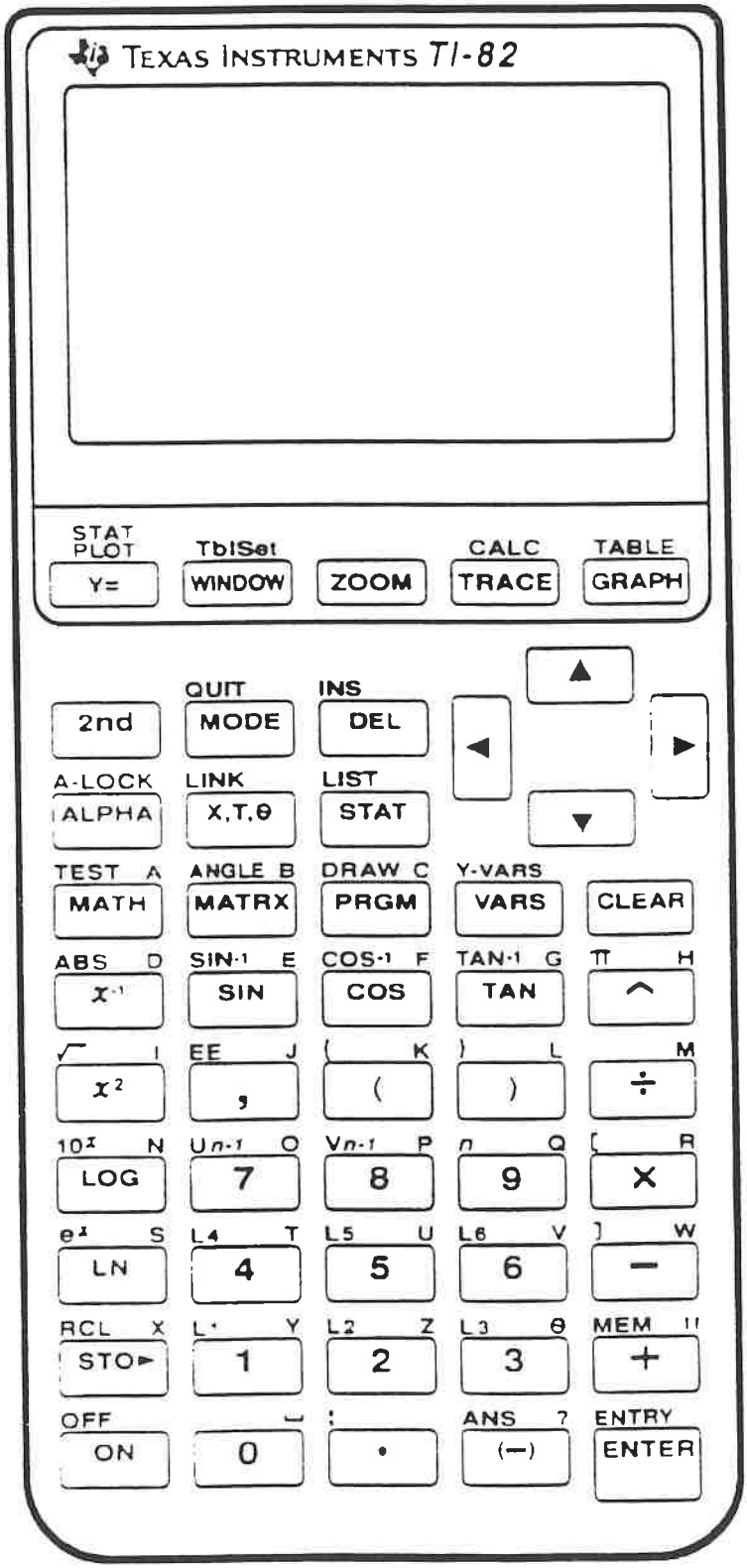
3.) $\sum_{1}^{100} (2x-10)$

4.) $\sum_{10}^{25} (2^{(x-9)})$

5.) $\sum_{22}^{25} (10x-200)$

6.) $\sum_{1}^{50} (x-26)$

Conclusion: The point of this exercise is to familiarize individuals with the different abilities of the TI-85. Hopefully, one should be able to identify the different parts of a sigma notation, and should know how to solve different sequences on the calculator.


TEXAS INSTRUMENTS TI-82
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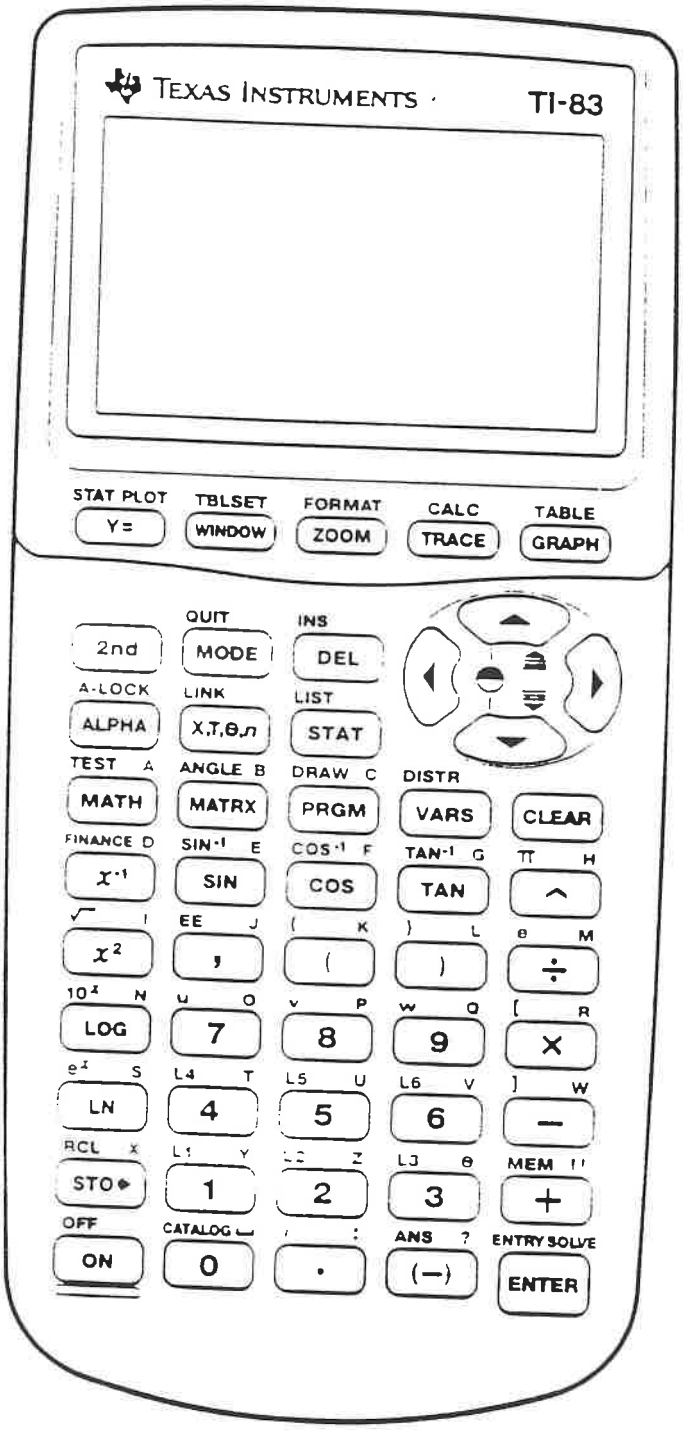
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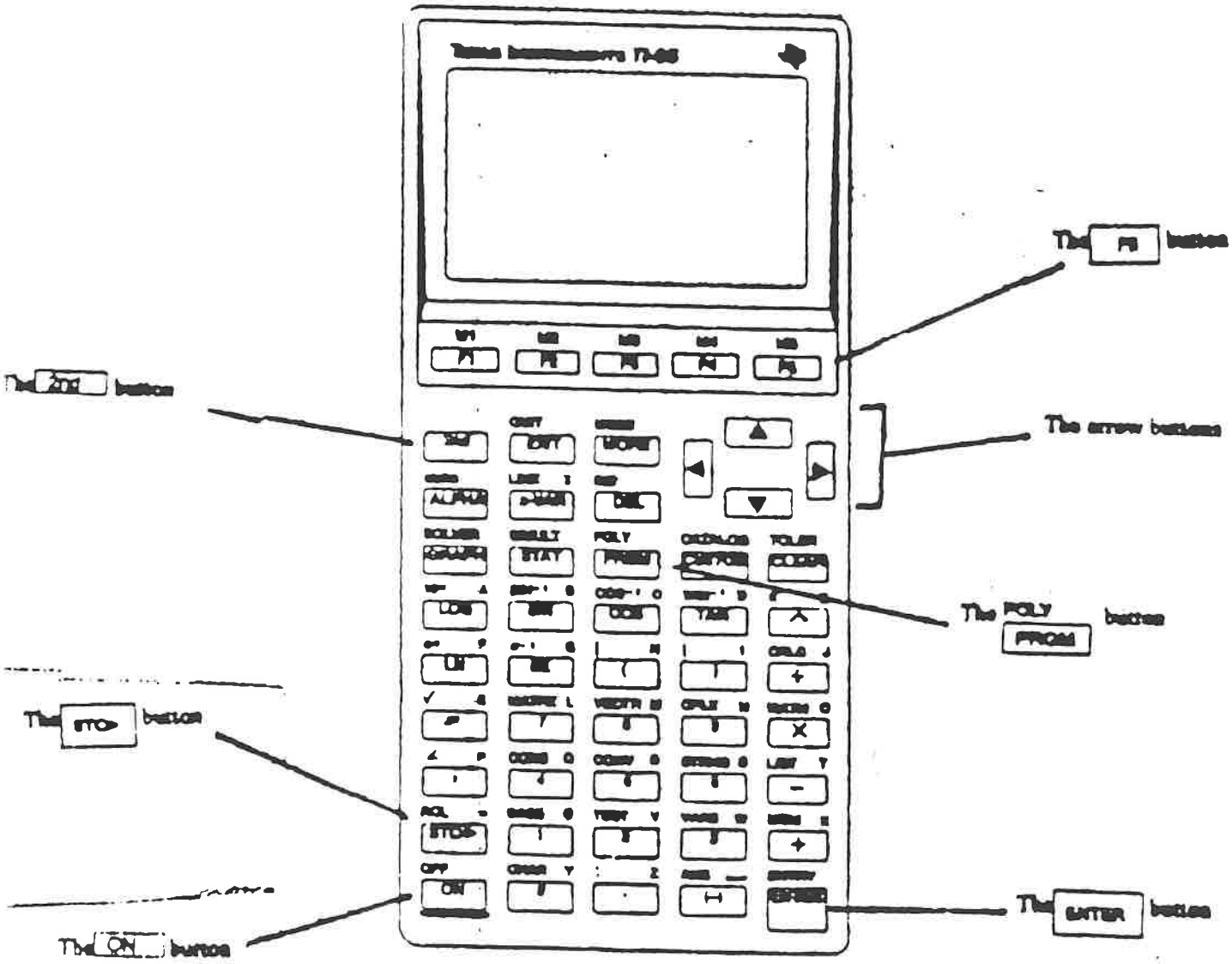
The F5 button
The 2nd button
The arrow buttons
The PRGM button
The STO button
The ON button
The ENTER button