

## Calculator Help for TI-83, TI-83 plus, TI-84 plus by Teresa McCullough

Start by ZOOM 6. This is the standard window. The first 10 problems are done in the standard window.

1. In the standard window of your calculator, graph the following. You should get a star.

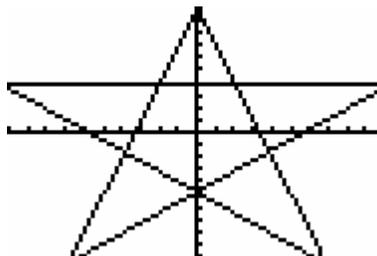
$$Y_1 = 10 + 3x$$

$$Y_2 = 4$$

$$Y_3 = -3x + 10$$

$$Y_4 = -0.84x - 4.84$$

$$Y_5 = \frac{21}{25}x - \frac{121}{25}$$

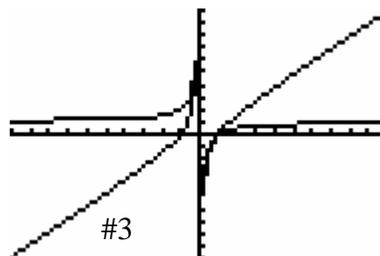
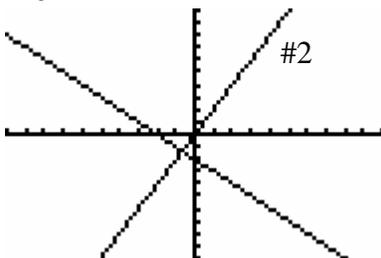


Clear all equations. For each pair of equations from 2 to 9, graph them both. You should get two distinct functions. The answers are shown, with even numbered problems having answers in the left column and with odd numbered problems having answers in the right column.

**Additional help is found starting on page 5.**

2.  $Y_1 = -x - 2$

$Y_2 = 2x$

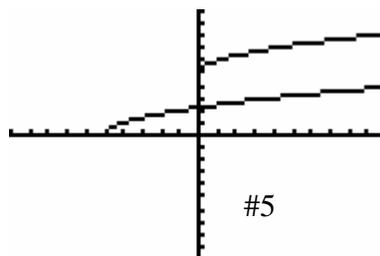
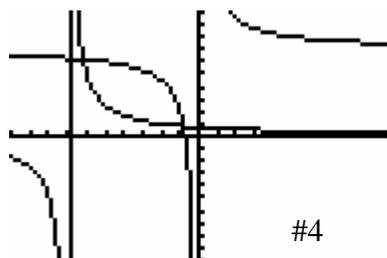


3.  $Y_1 = x - \frac{1}{x}$

$Y_2 = \frac{x-1}{x}$

4.  $Y_1 = \frac{5}{x} + 7$

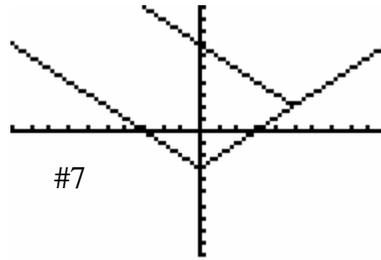
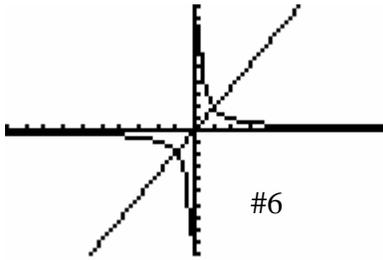
$Y_2 = \frac{5}{x+7}$



5.  $Y_1 = \sqrt{x+5}$

$Y_2 = \sqrt{x} + 5$

6.  $Y_1 = \frac{9}{5x}$        $Y_2 = 1.8x$

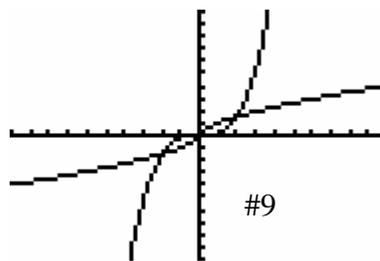
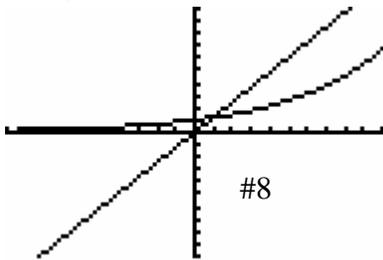


7.  $Y_1 = |x-5|+2$

$Y_2 = |x|-3$

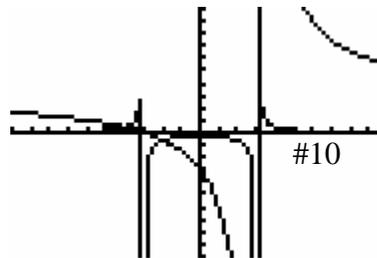
8.  $Y_1 = 1.1^{2x}$

$Y_2 = 1.21x$



9.  $Y_1 = 0.2x^3$        $Y_2 = x^{\frac{3}{5}}$

10.  $Y_1 = \frac{3}{(x-3)(x+3)}$        $Y_2 = \frac{3x+9}{x-3}$



*TI-82 users should enter*

$Y_2 = \frac{3}{x^2-9}$  for the second equation.

For problem 11, you will try to find the appropriate window for four functions. There is no single window that works for all of them. Graph them one at a time.

11. Graph the following. Find a window or range that displays the graph.

a.  $y = 0.2x + 50$       b.  $y = .001x$       c.  $y = 9999x^2$       d.  $f(x) = -0.3x^2 + x - 12$

**There are answers on the next page and additional help is on page 7.**

**Leave 11 d. in your calculator for problem number 12.**

Possible answers for 11: a. x: -10 to 10 by y: 48 to 50 b. x: -10 to 10 by y: -.01 to .01 c. x: -10 to 10 by y: 0 to 999900 d. x: -10 to 10 by y: -20 to 1

12. Find the local maximum for 11 d.

Answer: (1.667, -11.167)

13. Let  $Y_1 = x^2$  and  $Y_2 = 3 + x$

See pages 8 and 9 for help.

Evaluate  $Y_1$  and  $Y_2$  at  $x = 50$  and  $x = -1100$ .

Answers: 2500, 53, 1210000, and -1097

General information:

In the home screen

**2<sup>nd</sup> enter** repeats the previous line.

**2<sup>nd</sup> -** gives the answer to the previous evaluation (appearing as "Ans") and can be used anywhere in an expression.

14. Find  $8^{2/3}$ . You should get 4. Now find  $3 \times 4$  using  $3 \times \text{ans}$ . This gives 12. If you hit **enter** again you will get 36. What is the calculator doing?

15. Evaluate  $\frac{3 - 2^2}{7^2 - 6(3)}$ . Your answer should be -.032258... Now raise 2 to that power.. Your answer should be 0.977889

16. Find the point of intersection of the two equations  $5x + y = 10$  and  $3x + 7y = 12$ .

**Hint:** Solve both equations for y. On TI-83/84 use 2<sup>nd</sup> TRACE (CALC) 5, intersect.

(Answer: (1.81, .94))

17. Describe in one word the graph of  $y = |x| \pm \sqrt{1 - x^2}$  **Hint:** ZOOM 4. Zdecimal.

### 18. Plotting points on scattergrams

Enter the following data in  $L_1$  and  $L_2$ . Both can be entered using STAT and EDIT. 1,2,3,4 in  $L_1$  and 8,11,15,9 in  $L_2$ .

L1	L2	L3	2
1	8	-----	
2	11		
3	15		
4	9		
-----	██████████		

L2(5) =

Use 2<sup>nd</sup> “Y=” to go to the STAT PLOT menu.

Hit enter to turn on Plot 1.

ZOOM 9 will give you the statistical plot below.

```

STAT PLOTS
1: Plot1...Off
  L1 L2
2: Plot2...Off
  L1 L2
3: Plot3...Off
  L1 L2
4↓ PlotsOff
  
```

```

Plot1 Plot2 Plot3
Off Off Off
Type: [ ] [ ] [ ]
      [ ] [ ] [ ]
Xlist: L1
Ylist: L2
Mark: [ ] + .
  
```



19. Find all roots of the equation  $5x^2 - x^3 = 2x + 2$  (Answers: 1, 4.449, and -.449)

Method 1: In this method, subtract the right side from the left side.  $Y_1 = 5x^2 - x^3 - (2x + 2)$  and  $Y_2 = 0$ . Use INTERSECT for each of the three answers as in method 2

Method 2: Set  $Y_1 = 5x^2 - x^3$  and  $Y_2 = 2x + 2$  and use intersect. (See problem 16.) You will have to guess three times to get the three answers. When the calculator asks for a GUESS, move the cursor near an answer before you hit enter. You are only interested in the x value of the answer. One intersection is barely outside the window if you have the standard window, but that is not a problem. (Often it is a problem because you cannot find it.)

Method 3: Use the ZERO function.

## Harder problems

20. Find an appropriate window to display the features of the following functions.

a.  $y = -0.01x^2 - 5x + 8$  (Hint: This is a parabola; the window should contain its vertex.)

b.  $y = \frac{(x-15)(x+20)}{10}$  (Hint: your graph should display all intercepts and the vertex.)

c.  $f(x) = (x-22)(x-20)(x-24)$  (Hint: Where are its x-intercepts?)

Possible answers to 20: a. Xmin=-550, Xmax = 10, Ymin= -10, Ymax = 640

b. Xmin=-21, Xmax = 16, Ymin= -31, Ymax = 4

c. Xmin=19, Xmax = 25, Ymin= -15, Ymax = 15

21. Some equations are not easy to solve with a calculator. Try  $\sqrt{x+100} = x+100$ .

22. Not all simple appearing problems are easy to do by calculator.  $x^{2/7} - 8x^{1/7} = 9$  is a relatively simple problem to solve algebraically. But anyone relying on the calculator will be likely to miss the second answer.

## After Math 103

### For students in Math 180 and up

23. Graph  $y = \sin^2(x) + \cos^2(x)$

This should give you the horizontal line,  $y = 1$ .

24. Evaluate  $\sec^2\left(\frac{\pi}{4}\right)$

This should give you 2.

25. Evaluate  $\csc^{-1}(\sqrt{2})$

This should give you 0.785398

### For students in Math 182 and up

26. Let  $Y_1 = x^2$ . Graph the derivative of  $Y_1$  using  $Y_2 = nDeriv(Y_1, X, X)$ . “nDeriv(“ can be found using MATH 8. It should be the line  $y = 2x$

27. Find  $\frac{dy}{dx}$  evaluated at  $x = 3$  using  $nDeriv(Y_1, X, 3)$ . (Answer: 6)

28. Evaluate  $\int_{-1}^4 x^2 dx$  by using  $fnInt(Y_1, X, -1, 4)$ . Use MATH 9. (Answer: 21.67)

## Additional Help

These refer to problems starting on page 1.

1. Your “Y=” screen should look like this.

```

Plot1 Plot2 Plot3
\Y1=10+3X
\Y2=4
\Y3=-3X+10
\Y4=-.84X-4.84
\Y5=21/25X-i21/2
5
\Y6=■

```

If you are using a TI-82, put the parentheses in equation 5. It does not hurt to do so for other calculators, but they are not needed.

```

Plot1 Plot2 Plot3
\Y1=10+3X
\Y2=4
\Y3=-3X+10
\Y4=-.84X-4.84
\Y5=(21/25)X-121
<25
\Y6=

```

2. Note the difference between the negative sign (in front of the X) and the minus sign (between the X and the 2).

```

Plot1 Plot2 Plot3
\Y1=-X-2
\Y2=2X
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

3. and 4. Parentheses are needed for the second equation.

```

Plot1 Plot2 Plot3
\Y1=X-1/X
\Y2=(X-1)/X
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

```

Plot1 Plot2 Plot3
\Y1=5/X+7
\Y2=5/(X+7)
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

5. It is not necessary to have the closed parenthesis in the first equation, but it is a good habit. The closed parenthesis is needed in the second equation.

```

Plot1 Plot2 Plot3
\Y1=√(X+5)
\Y2=√(X)+5
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

6. Put parenthesis around the 5X.

```

Plot1 Plot2 Plot3
\Y1=9/(5X)
\Y2=1.8X
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

7. Absolute value is found in MATH menu. (It is in the left column.) Then use the right arrow key to go to NUM.

```
MATH NUM CPX PRB
1:abs(
2:round(
3:iPart(
4:fPart(
5:int(
6:min(
7:↓max(
```

```
Plot1 Plot2 Plot3
\Y1=abs(X-5)+2
\Y2=abs(X)-3
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

Notice that the parentheses are needed to close the absolute value sign.

8. and 9. The symbol ^ is used for exponents. Parentheses go around the exponent unless it is a number or a single character.

```
Plot1 Plot2 Plot3
\Y1=1.1^(2X)
\Y2=1.21X
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

```
Plot1 Plot2 Plot3
\Y1=.2X^3
\Y2=X^(3/5)
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

10. Remember parentheses! Some newer TI-84's do not show vertical lines where there are asymptotes.

```
Plot1 Plot2 Plot3
\Y1=3/((X-3)(X+3))
\Y2=(3X+9)/(X-3)
\Y3=
\Y4=
\Y5=
```

11. a. This is a line. Find its y-intercept. Ymin should be less than the y-intercept and Ymax should be greater than the y-intercept.

b., c., and d. all of these can be found by using ZoomFit (which is ZOOM 0.) This does not change the x values, but changes Ymin and Ymax to fit the y values of the functions. This does not always work, because sometimes one needs to change the x-values as well. There are equations where no single window shows all important features of a graph.

d. "f(x)=" should be treated the same as "y=".

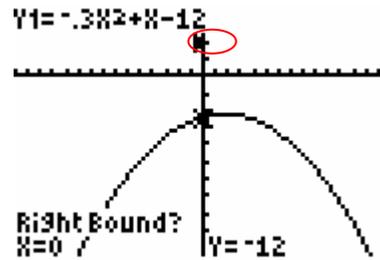
12. Using the window shown, take the following steps to find a local maximum of a function:

a) Go to the CALC menu (2<sup>nd</sup> TRACE) and go to maximum or hit "4".

```
WINDOW
Xmin=-15
Xmax=15
Xscl=1
Ymin=-52
Ymax=20
Yscl=5
Xres=
```

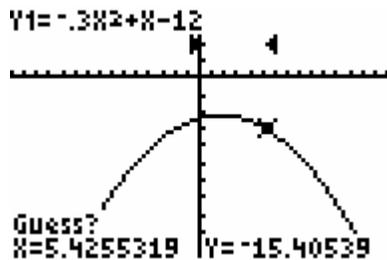
```
2:TRACE
1:value
2:zero
3:minimum
4:maximum
5:intersect
6:dy/dx
7:∫f(x)dx
```

b) The screen will come up with the question “Left Bound?” In this case, the left bound is acceptable. Hit enter. Notice the mark on the screen showing the left bound.

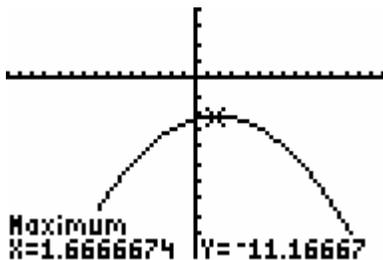


c) The screen will come up with the question “Right Bound?” Move the cursor until it is well to the right of the maximum value. A comparable mark will be shown on the screen.

d) It now asks you to guess. It guesses faster than you do, so hit enter.



e) Now the coordinates of the maximum value of the function between the two marks is displayed.



13. If the x-values are between Xmin and Xmax, the 1: value, from the CALC menu (2<sup>nd</sup> TRACE) is easiest to use. If not, try method a or b below.

a. Use TBLSET (2<sup>nd</sup> WINDOW) and TABLE (2<sup>nd</sup> GRAPH) First, use TBLSET to set the independent variable to Ask. (Note: It is often valuable to use Auto for the independent variable; remember how to go back.)

```
TABLE SETUP
TblStart=
ΔTbl=1
Indent: Auto
Depend: Ask
```

Type “50” in the left column and hit enter. Type “-1100” under it and hit enter. The values for the two functions will appear under Y<sub>1</sub> and Y<sub>2</sub>. To save space, the values in Y<sub>1</sub> and Y<sub>2</sub> may be in scientific notation. If you highlight them, as shown, the values will appear below. You may delete values in the table.

X	Y <sub>1</sub>	Y <sub>2</sub>
50	2500	53
-1100	1.21E+08	-1097

Y<sub>1</sub>=1210000

b. Another approach is to go into the home screen, using QUIT (2<sup>nd</sup> MODE) and VARS, Y-VARS, 1: Function, and either Y<sub>1</sub> or Y<sub>2</sub>, depending upon which function is desired. Treat it like a function and put the x-value in parentheses after Y<sub>1</sub> or Y<sub>2</sub>.

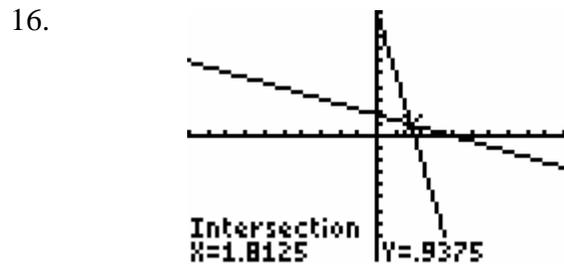
```

Y2(50)
                    53
Y1(-1100)
                    1210000
  
```

Before doing #14 and #15, go to the home screen using QUIT (2<sup>nd</sup> MODE.)

14.  $8^{(2/3)}$   
 3\*Ans  
 12  
 36  
 108  
 324

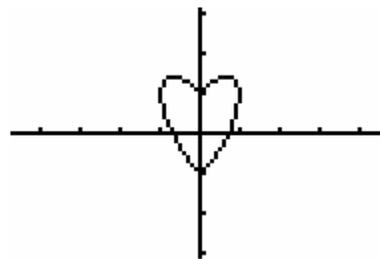
15.  $(3-2^2)/(7^2-6(3))$   
 -.0322580645  
 2^Ans  
 .9778885363



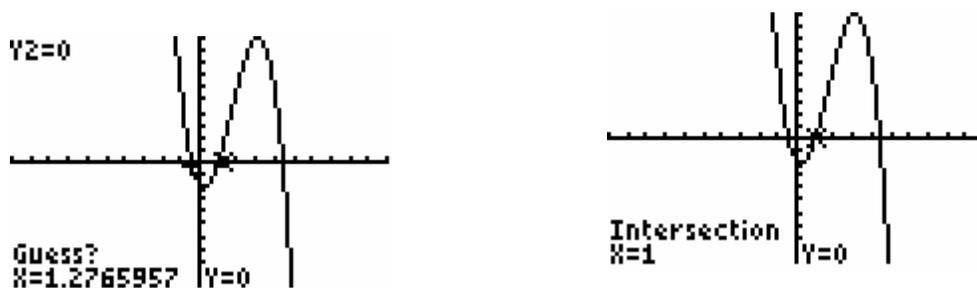
17. You must do two equations, one for the plus sign and one for the minus sign.

```

Plot1 Plot2 Plot3
\Y1=abs(X)+√(1-X
z)
\Y2=abs(X)-√(1-X
z)
\Y3=
\Y4=
\Y5=
  
```



19. Once the first zero is found, move the cursor near the answer. Be sure to hit enter, to actually get the answer.



21. There are two, solutions,  $x = -99$  and  $x = -100$ , but you might miss one.

22. Algebraically:  $x^{7/2} - 8x^{1/2} = 9$

$$x^{7/2} - 8x^{1/2} - 9 = 0$$

$$(x^{1/2} - 9)(x^{1/2} + 1) = 0$$

$$x^{1/2} - 9 = 0 \quad \text{or} \quad x^{1/2} + 1 = 0$$

$$x^{1/2} = 9 \quad \quad \quad x^{1/2} = -1$$

$$(x^{1/2})^7 = 9^7 \quad \quad \quad (x^{1/2})^7 = (-1)^7$$

$$x = 9^7 = 4,782,969 \quad \quad \quad x = -1$$

It is easy to see why one might miss a solution on the calculator.

23. 

```
Plot1 Plot2 Plot3
\Y1= sin(X)^2+cos(
X)^2
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
```

24. Be sure your calculator is in radian mode.

$$1/\cos(\pi/4)^2 \quad 2$$

Or  $(1/\cos(\pi/4))^2 \quad 2$

25. Again, this assumes radian mode.

```
sin^-1(1/sqrt(2))
.7853981634
```