

Graphing on the TI-83

As an example, let's graph the function

$$F(x) = .001x^3 - .012x^2 + .004x - .2$$

Press the **Y=** button, and type in our function. Use the **^** key for the exponents. If Plot1 or Plot2 or Plot3 (up at the top) are highlighted, go up and turn them off with the Enter key.

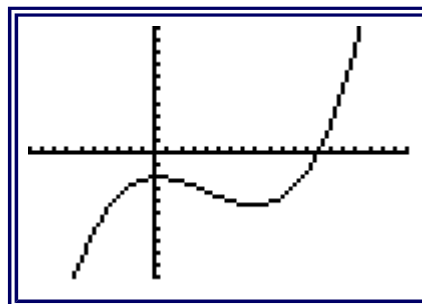
Now press **Window**, and set your viewing window so that you have a good view of the graph. Unless you have some information about what x and y represent (which usually gives you an idea of what kind of scale to set on your graph), it's generally best to start with fairly small values for Xmin and Xmax, and take a guess on how to set the y-values by looking at the function. In our example, the y-intercept is -0.2 , and the other numbers are all pretty small, so we probably want rather small values for Ymin and Ymax. If you make a bad guess on Ymin and Ymax and can't see much of anything, try tracing; look at the coordinates displayed to get an idea of how to set the range.

Once you have your window set, press **Graph**. If you don't have a good view of the graph, adjust your window as needed. See if you can find a window that makes the graph look like the picture shown here.

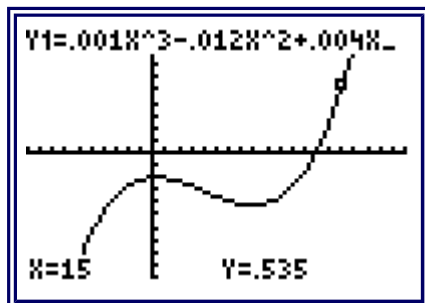
```

Plot1 Plot2 Plot3
\Y1=.001X^3-.012
X^2+.004X-.2
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=

```



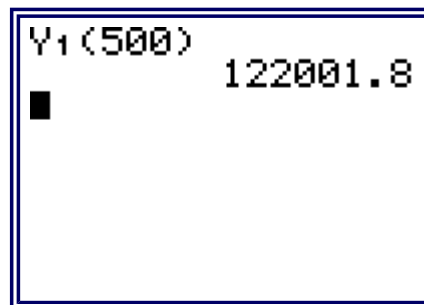
Finding Y if you know X



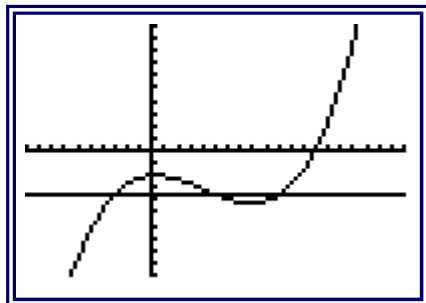
Once you have a good graph of the function in our example (see above), press **Trace**, and use the arrow keys to trace along the graph. You'll see coordinates of points on the graph displayed along the bottom of the screen. If you need to find the value of the function at some particular x-value, just type it in from the keyboard while you are in Trace mode. For example, let's find $F(15)$. Just type in 15, and press Enter. You should get $y = .535$. If you get an error message that says **Invalid**, that means that $x = 15$ is not in your window. If that happens, just quit, then adjust your

window and try again.

Another way to find y if you know x is to go to the Homescreen (press **2nd Quit** to get out of the graph). Then press **VARS**, arrow over to **Y-VARS**, press Enter, pick out the variable that your function is stored in (probably Y_1), and press Enter. Then type in a left parenthesis, then the number to you want to substitute into the function, then close the parentheses. As an example, try finding $f(500)$. The answer should be 122001.8.



Finding X if you know Y

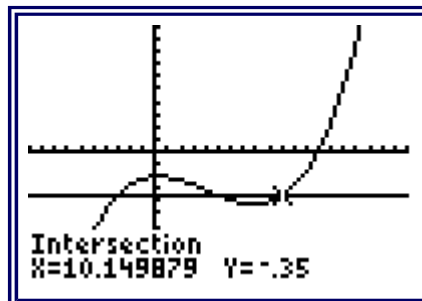


As an example, let's find all values of x for which $F(x) = -0.35$. To do this, we graph the (horizontal) line $y = -0.35$ and find where it intersects our curve. To begin, put -0.35 into Y_2 , and press Graph.

Now find where our curve intersects the line. Press **2nd Calc** (it's above the Trace key) and select **Intersect**. It asks you for the first curve

(just press Enter), then the second curve (press Enter). (If you had more than two functions graphed, you would use the up/down arrow keys to pick the two that you want.) Now it asks for a guess.

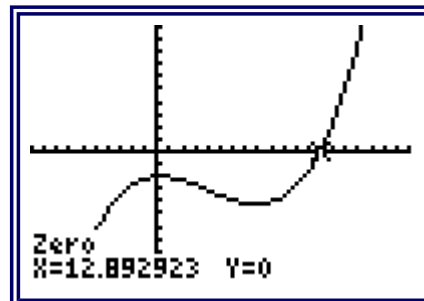
Use the arrow keys to trace over to one of the points where our curve intersects with the line, then press Enter. The screen will say **Intersection**, and below that will be the coordinates of the point that you were looking for. Repeat the process to find the others. You should get three answers, which round to $x = -3.029$, $x = 4.879$, and $x = 10.150$.



Finding Roots

Recall that a *root* of a function is a value of x where the function equals zero (in other words, an x -intercept). The function in our example has one root. Let's find where it is.

First, go into **Y=** and clear out the line that we put into Y_2 , then press **Graph**. Now press **2nd Calc** and select **Zero** (since we are trying to find where our $f(x)=0$). It asks for a Left Bound; trace over to a point a little to the left of the root, and press **Enter**. It now asks for a Right Bound; trace to a point a little to the right of the root and press **Enter**. Now it asks for a Guess; trace to a point near the root, in between your left and right bounds, then press **Enter**. This will give you the root (also called a "zero"). Your answer should be $x=12.893$ (rounding).



Another way to find X if you know Y

```
EQUATION SOLVER
eqn: 0=
```

Another way to find X if you know Y is to use the Equation Solver. Let's re-do our example from above, finding all the values where $F(x)=-0.35$, and the point where $F(x)=0$ (the root). We'll find the root first.

Press the **Math** button, then select **Solver** (it's the last item on the menu).

On the line that says *eqn*, after the $0=$, paste in Y_1

(press **VAR**S, pick Y-VARS, then pick Y_1), then press Enter. On the X line, type in a guess for where you think the root of our function is. If you go back and trace along the graph, you'll find that the root is somewhere around $x=13$, so let's use that.

```
Y1=0
X=13
bound={-1E99, 1...
```

```
Y1=0
▪ X=12.892922910...
bound={-1E99, 1...
▪ left-rt=0
```

Make sure the cursor is on the X line, and press the green **Alpha** button, then the Enter key. This will give you the solution to the equation $Y_1=0$, which should be the same as the root that we got before.

Now let's find the solutions to the equation $F(x)=-.35$.

This is the same as solving

the equation $Y_1+.35=0$ (if we add .35 to both sides). Go up to the equation line, and change the equation to $0=Y_1+.35$, press Enter, and type in a guess for one of the solutions to the equation (go and trace along the graph to get a good guess, then come back to this screen). Then press **Alpha** and the Enter key to get the solution.

Repeat the process to find all of the solutions to the equation. You should get the same results we got above when we solved the question graphically.

```
Y1+.35=0
▪ X= -3.0289550431
bound={-1E99, 1...
▪ left-rt=0
```