6 Important Graphing Calculator Skills

Recognizing Exact vs. Approximate Values

We need to be able to recognize when the calculator is giving an exact value or an approximate value. If the calculator gives a decimal number that displays 10 digits (the limit for the output from the TI-83 or TI-84), then it is (most likely) an approximate value.

Suppose we need to find $\sqrt{74}$. We enter [2nd] [x^2] `74` [ENTER] and the calculator gives `8.602325267`. So, to the nearest ten-thousandth, $\sqrt{74} \approx 8.6023$.

If, for example, we need to calculate the decimal for $\frac{57}{200}$, we enter `57` [÷] `200` and the calculator gives `.285`. This decimal does not use the 10 digits, so we know $\frac{57}{200} = 0.285$.

When we use the TI-83 or TI-84 to do computations on the home screen, the calculator will display a maximum of 10 digits of the result. When we do computations on the graph of a function (as we will in the next two skills), the calculator will often display fewer digits of the result.

Evaluating a Function

The TI-*xx* calculators include many methods of evaluating functions. Here's one of the most useful. Suppose $f(x) = \frac{x^2-3x+2}{2x^2+5x+19}$ and that we want to find $f(-7)$.

Go to the [Y=] menu and enter the function: `y1=(x^2-3x+2)/(2x^2+5x+19)` Then [2nd] [MODE] will return us to the home screen. Press [VARS] ⇒ `Y-vars` ⇒ `Function` and select `Y1`. This places `Y1` on the home screen. Press [(] [(−)] `7` [)] and then [ENTER]. The calculator gives us `.8780487805`. To see that result as a fraction, press [MATH] `▶Frac` [ENTER] and then [ENTER]. The calculator shows `36/41`.

Setting the Window

Practice makes perfect for this skill. Complete "Graphing Calculator I: Setting the Window."

Finding the Intersection of the Graphs of Two Functions

Let's find the points of intersection of the functions $y = \frac{1}{2}x^3 + \frac{19}{10}x^2 - \frac{41}{10}x - \frac{11}{2}$ and $y = \frac{4}{5}x + 1$.

Go to the [Y=] menu and enter the two equations. Then to graph using the standard window[1], [ZOOM] 6. We'll find the rightmost intersection in this example.

[2nd] [TRACE] gives us the [CALC] menu. Note that choice 5 is `intersect`; select 5. The calculator returns to the graph and asks you the first of three questions:

`First curve?` Using the up or down cursor keys, move the blinking cursor onto either of the graphs whose intersection you wish to find. Press [ENTER]

`Second curve?` Using the up or down cursor keys, move the blinking cursor onto the other graph. Press [ENTER]

`Guess?` Using the left or right cursor keys, move the blinking somewhere near the intersection you want to find. Press [ENTER]

The calculator does a little work (actually a lot of work!) and at the bottom of the window we see

`x=2.431003 y=2.9448024`

Here, the calculator is displaying approximate values.

Finding Real Zeros (x-intercepts) of a Function

Let's find the real zeros (x-intercepts) of the function $y = \frac{1}{2}x^3 + \frac{19}{10}x^2 - \frac{41}{10}x - \frac{11}{2}$.

Go to the [Y=] menu and enter the equation. Then to graph using the standard window[2], [ZOOM] 6. We'll find the rightmost zero in this example.

[2nd] [TRACE] gives us the [CALC] menu. Note that choice 2 is `zero`; select 2. the calculator returns to the graph and asks you the first of three questions:

`Left Bound?` Using the left or right cursor keys, move the blinking cursor somewhere to the left of the zero you wish to find. Press [ENTER]

`Right Bound?` Using the left or right cursor keys, move the blinking cursor somewhere to the right of the zero you wish to find. Press [ENTER]

`Guess?` Using the left or right cursor keys, move the blinking somewhere near the intersection you want to find. Press [ENTER]

The calculator does a little work (actually a lot of work!) and at the bottom of the window we see

`x=2.2 y=0`

In this particular example, the calculator has given us the exact value. (How can we tell?) Usually, this calculation will give approximate values.

[1] Frequently, we will need to adjust the window to see the intersections.
[2] Frequently, we will need to adjust the window to see all the zeros.

Data Analysis

There are four steps to follow when analyzing two-variable [3] data with a graphing calculator:

i Get the data into the calculator.

ii Create an appropriate display for the data, *i.e.*, graph the data.

iii Use the calculator to fit a function to the data, *i.e.*, find an equation.

iv Use the function to interpret the data.

Let's find a function to fit the data shown below.

independent variable	2	7	8	10
dependent variable	89.6	116.4	127.3	142.9

Get the data into the calculator. First, think carefully about the situation the data describes and determine the independent and dependent variables. For the TI-*xx* calculators, the independent variable is always `x` and the dependent variable is always `y`.

[STAT] `Edit` [ENTER] then type the independent variable data into `L1` and the dependent variable into `L2`. Type [2nd] [MODE] to exit the data entry.

Create an appropriate display for the data, *i.e.*, graph the data. With two-variable data, we will almost always use a scatter plot to display the data.

[2nd] [Y=] to access the Stat Plot menu. [ENTER] to set up `Plot1`. On this menu, turn the plot `On`, select the first icon (scatter plot) on the `Type` list, set `Xlist` to `L1`, and set `Ylist` to `L2`. Finally, [ZOOM] `ZoomStat` and [ENTER].

Use the calculator to fit a function to the data, *i.e.*, find an equation. [STAT] `Calc` and then select the type of function that you want ot fit to the data. For this example, we'll use a linear function. Select `LinReg(ax+b)`. Then [2nd] L1 [,] [2nd] L2 [,] [VARS] `Y-VARS Function Y1`. Finally, [ENTER] computes the equation of the function and stores the equation in `Y1`. Pressing [GRAPH] displays the scatter plot along with the graph of the function.

Use the function to interpret the data. If we've followed these steps correctly, we should have
`Y1=6.5338129496403x+74.946762589928`
We can use this function to interpret the data as we would use any function.

[3] The graphing calculator is capable of handling many other types of data. Take a course in statistics if you're curious.