More Graphing
Turning Equations On and Off, Line Thickness, and Shading for Inequalities
Instructions for the TI-84 Plus

Example: Graph $y = x + 3$, $y + x = 2$ and $y = -3$ on the same axis and label each line.

Graphing
If you are not comfortable with the graphing capabilities of the calculator, please work through the *Preparing the Calculator for Graphing* and the *Graphing an Equation* help pages.

First, we need to enter these three equations into the function editor of the calculator, so press [Y=]. Use the arrow keys and the CLEAR button to clear out any equations that are already in your calculator. Use the arrow keys to place the cursor to the right of the equal sign beside Y_1. Press [X,T,θ,n] [+] [3] to enter the first equation. We must solve the second equation for *y* before we can enter it. We get $y = -x + 2$, so use the arrow keys to place the cursor to the right of the equal sign beside Y_2 and press [(−)] [X,T,θ,n] [+] [2]. For the last equation, use the arrow keys to place your cursor to the right of the equal sign beside Y_3 and press [(−)] [3]. Your calculator should look like figure 1.
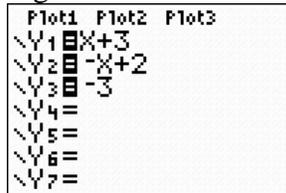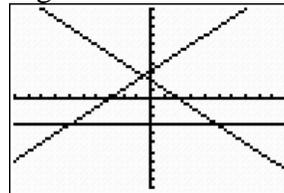
Fig. 1

Fig. 2

To graph these equations, press [GRAPH]. These three equations display nicely on the standard graphing window, so if you do not see these three lines, press [ZOOM] [6] to adjust the graphing window. You should see figure 2.

Now you need to label the lines. When you change the zoom level or graph the first time, the equations will graph in order (Y_1 first, Y_2 second, etc.). If you want to watch them graph in order again, press [ZOOM] [6] again and watch closely as they graph. If you want the lines to have a different appearance even after they graph, you can change the thickness of a line. Your other option is to turn off equations so that they are still in the calculator for you to use, but they will not graph. We will discuss these options next.

Changing the Thickness of a Line

If you want to see all three lines at the same time but have them look different, you can change the thickness of the lines. Press [Y=] to enter the function editor. Let's leave Y_1 with the standard thin line. Use the arrow keys to place your cursor on the slanted line in front of Y_2 and press [ENTER] to make the line thick. Use the arrow keys to place your cursor on the slanted line in from of Y_3 and press [ENTER] (probably four times) until the slanted line changes to a dash then a circle.

Now your function editor screen should look like figure 3.

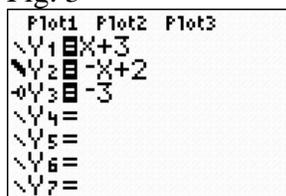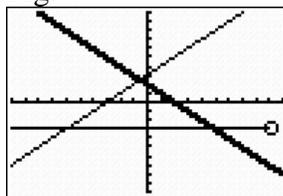Fig. 3   Fig. 4

When you press graph, your first equation will be drawn with the standard thin line. The second equation will be drawn with a thick line. The third equation will be drawn slowly with the standard thin line, but as it draws, a circle will lead where the line will be drawn. Figure 4 was captured as the line was being drawn. (The marks in the upper right corner of the screen indicate that the calculator is still processing information – in this case, drawing the graph).

Turning Equations On and Off

Press [Y=] to enter the function editor. To turn off an equation so that it will not display, use the arrow keys to place the cursor on the equal sign beside that equation and press [ENTER]. If you turn off Y_2 and Y_3 then press [GRAPH], your function editor should look like figure 5 and your graphing screen should look like figure 6.

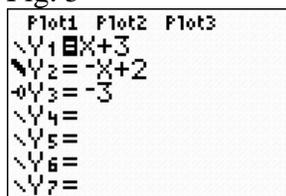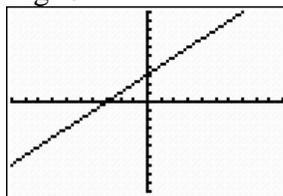Fig. 5   Fig. 6

To turn the equation back on, enter the function editor (press [Y=]) and use your arrow keys to put your cursor on the equal sign again and press [ENTER]. An equation is turned on (will graph and appear in tables) if the equal sign is highlighted. An equation is turned off (will NOT graph or appear in tables) if the equal sign is not highlighted.

Shading for Inequalities

Your calculator can shade inequalities, but you have to tell it which side of the line to shade.

Example: Graph $y \le x + 3$, $y + x \ge 2$ and $y \ge -3$ on the same axis and label each line.

To graph $y \le x + 3$, you need to decide whether the calculator should graph above or below the line. First, (just like when you are graphing by hand) pick a test point that is not on the line. The point (0,0) is not on any of our lines, so let's pick that point. Second, test the point in the inequality. When we replace both x and y with 0, we get the inequality $0 \le 0 + 3$ which is true. That means that we want to shade the side of the line that the test point, (0,0) is on. Looking back at our previous graphs in this lesson, we know that the test point (0,0) is BELOW the line $y = x + 3$, so we want to shade below the line. Press $\boxed{\text{Y=}}$ to enter the function editorUse the arrow keys to put your cursor on the slanted line in front of Y_1 and press $\boxed{\text{ENTER}}$ until the slanted line changes to look like a line that has been shaded below the line. When we use the test point (0,0) with the inequality $y + x \ge 2$, we get the false statement $0 + 0 \ge 2$, so we want to shade the side that the test point (0,0) is NOT on. Therefore, we shade ABOVE $y + x = 2$ by placing the cursor on the slanted line in front of Y_2 and pressing $\boxed{\text{ENTER}}$ until the slanted line changes to look like a line that has been shaded above the line. When we use this same procedure with the test point (0,0) and $y \ge -3$, we get the true statement $0 \ge -3$. Therefore, we shade the side of the line that the test point is on, so we shade ABOVE $y = -3$ using the arrow keys and $\boxed{\text{ENTER}}$ repeatedly.

If you did not turn the equations back ON in the previous exercise, please do that now. Your function editor should look like figure 7.
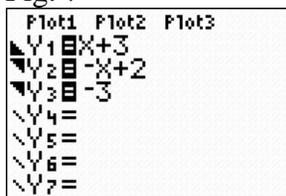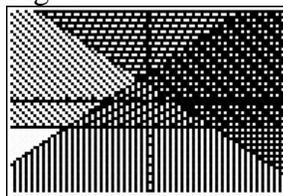
Fig. 7   Fig. 8

When you press $\boxed{\text{GRAPH}}$, you will get the graph in figure 8. The part that is shaded the darkest is shaded by all three inequalities, so it is the part of the graph that is true for all three inequalities at the same time. You can use your work from our previous exercises to label the lines.