Section 2.3: Solving Linear Equations Involving Fractions and Decimals
Math 102 Course Outline Unit II

Objective: Solve linear equations graphically.

This section was covered earlier in the course. Students solved linear equations algebraically and checked solutions "by hand" and using the graphing calculator home screen. Now we will show students how to check their solutions graphically with the intersection of graphs method using the intersect feature on the graphing calculator.

> Remember, 102 students are not yet familiar with a system of equations, so it is best to avoid using this terminology.

New calculator feature used in this lesson:

CALC(2nd TRACE), ***5:intersect***

Intersection of Graphs Method for Solving an Equation

1. Graph $y_1 =$ left side of the equation and $y_2 =$ right side of the equation.

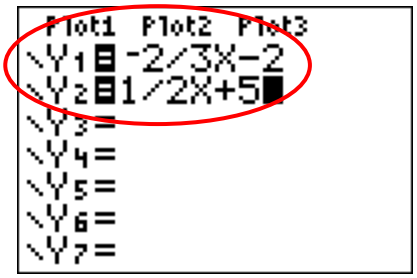
2. Find the point of intersection of the two graphs.

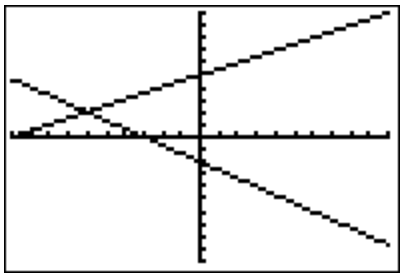
3. The x-coordinate of the point of intersection is the solution to the equation.

Example: Solve $-\frac{2}{3}x - 2 = \frac{1}{2}x + 5$ graphically.

Solution: Turn off or CLEAR any equations in the Y= editor.

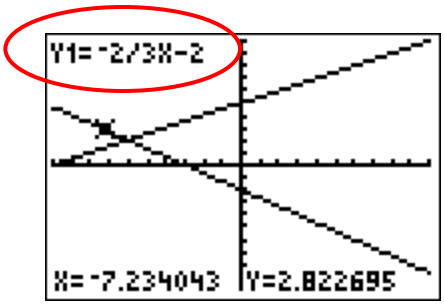
1. Enter the left side of the equation as $\mathbf{Y_1}$ and the right side of the equation as $\mathbf{Y_2}$: $Y_1 = -\frac{2}{3}x - 2$ and $Y_2 = \frac{1}{2}x + 5$. (Use the Standard window for the initial graph.)



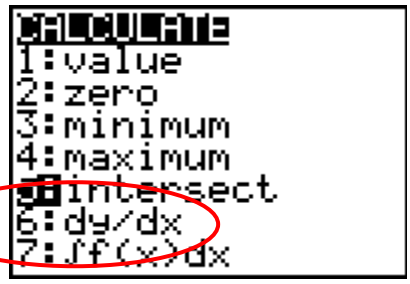


Use the TRACE key to move the cursor close to the point of intersection. (Notice that when you are in TRACE, the equation of $\mathbf{Y_1}$ appears in the upper left corner

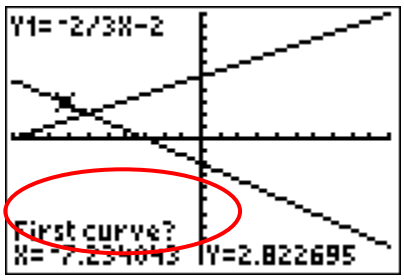
of the screen. Hit [▼], and the equation of Y_2 appears in the upper left corner.)



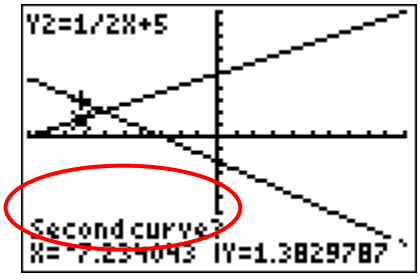
2. The "intersect" feature is in the ***CALC*** menu. Press ***CALC***([2nd] [TRACE]). [▼] down to ***5: intersect***, and press [ENTER] (or simply press [5]).



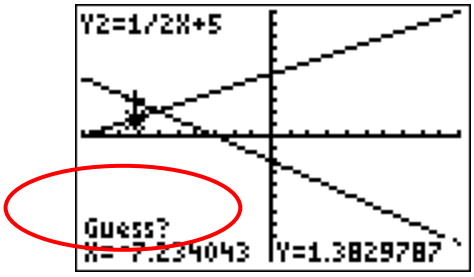
Notice the prompt ***"First curve?"***. The calculator is prompting you to place your cursor on the first graph (Y_1), if you haven't already done so.



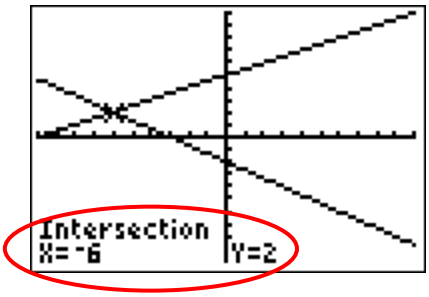
Press [ENTER] and notice the second prompt, ***"Second curve?"***. Now the calculator is prompting you to place your cursor on the second graph (Y_2), if you haven't already done so.



Press ENTER. The last prompt is ***"Guess?"*** If you want to move your cursor so that it is closer to the point of intersection, do so now. (You may want to point out to students that although this is not important with two linear graphs, non-linear graphs may intersect more than once, in which case it is important to move the cursor near the desired point of intersection.)



Otherwise, press ENTER, and you'll see the screen below.



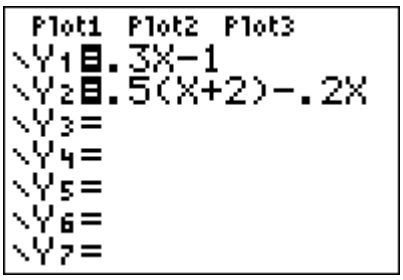
The point of intersection is (-6, 2).

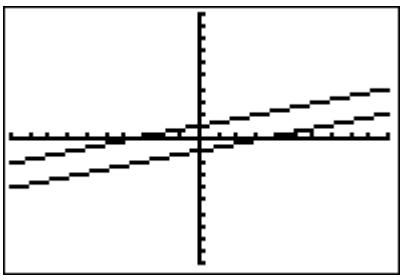
3. Since the x-coordinate of the point of intersection is -6, the solution to the equation is -6. Be sure to reinforce to students that the solution is always the x-value, even if the equation contains the variable y (i.e. $3y-6=11+\frac{1}{2}y$).

Instructor Notes:

1. You may want to show an example of an equation with no solution and an example of an identity (solution is all real numbers). It would be best to have students first solve by hand, find that there is no solution or that it is an identity with a solution of all real numbers, and then use this graphical method to verify their answer.

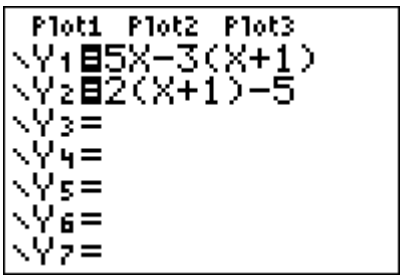
    a. No Solution ***- Exercise 91*** (p. 109): $0.3x-1=0.5(x+2)-0.2x$.

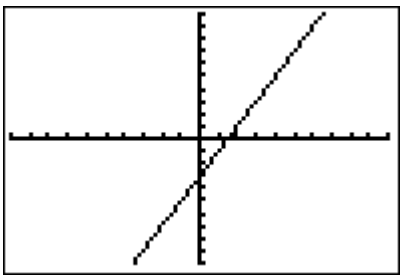




Tell students that when using the intersection of graphs method to verify an equation with no solution, the graphs of the left and right sides of the equation will not intersect.

b. Identity(solution is all real numbers) – ***Exercise 78***(p. 109):
$5m - 3(m + 1) = 2(m + 1) - 5$





Tell students that when using the intersection of graphs method to verify an identity, the graphs of the left and right sides of the equation will be the same, and students will only see one line in the calculator.

2. It is preferable not to explain the process of using the intersect feature as just "pressing ENTER three times." Remind students what each of the three prompts means (***"First curve?"*** , ***"Second curve?"***, and ***"Guess?"***). This will help students as they move on to graph non-linear curves in MATH 104 and 148. It will also help when they have more than two equations entered in their Y= editor.

3. If students ask what the y-value of the point of intersection represents, you may tell them that it is the value of both the left and the right side of the equation when the solution is substituted for the variable.