Understanding Solutions of Systems Using Tables and Graphs

Topic: Linear Systems

- *Graph a pair of linear equations and estimate their solution using the Intersection Point(s) command.*

Activity Overview

In this activity, students graph two linear functions and estimate the solution of the system graphically using the trace feature. Then they examine functions tables to find the exact solution of the system.

Teacher Preparation

- *This activity is appropriate for students in Algebra 1. It is assumed that students are familiar with linear functions and their graphs.*

Classroom Management

- *This activity is designed to have students explore **individually and in pairs**. However, an alternate approach would be to use the activity in a whole-class format. By using the computer software and the questions found on the student worksheet, you can lead an interactive class discussion solutions of systems.*

- *This worksheet is intended to guide students through the main ideas of the activity. You may wish to have the class record their answers on separate sheets of paper, or just use the questions posed to engage a class discussion.*

TI-84 Plus Applications

none

Understanding Solutions of Systems Using Tables and Graphs

In this activity you will

- *enter two linear equations in Y1 and Y2*

- *examine the graph and tables to identify where they two equations are equal to find the solution to the system*

Use this document as a reference and record your answers on a separate sheet of paper.

Press Y=. Enter the equations for the two lines as shown.
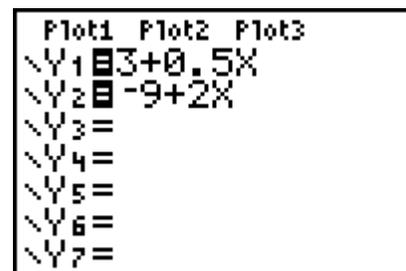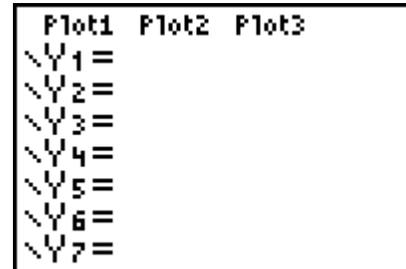
Press WINDOW. Set the window as shown.

*NOTE: This is a friendly window that gives nice decimals when tracing functions. Because of the dimensions of the graphing screen, a friendly window can be obtained by making the **Xmin** and **Xmax** multiples of 4.7 and the **Ymin** and **Ymax** multiples of 3.1.
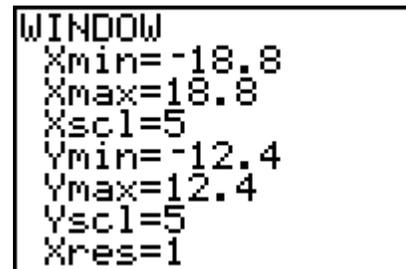
Press GRAPH. The solution to this system occurs where the two equations are equal. Where does this appear to occur?
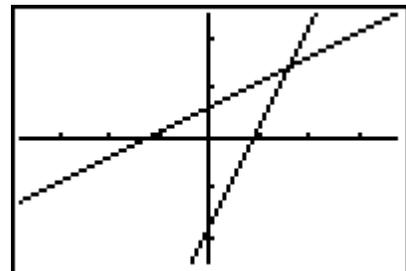
Press TRACE. You will be tracing on the function in Y1, as indicated in the top left corner of the screen. Use the left and right arrows to move the cursor to the point where the two lines intersect.

*NOTE: You will notice that the *x*-values change by 2-tenths as you move the cursor. It appears that the two lines intersect at the point (8, 7).
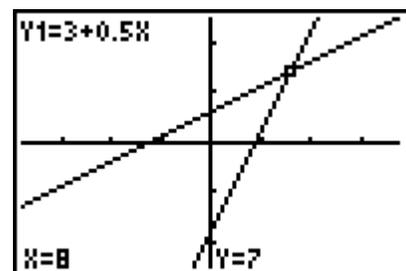
Press ▾. This will move your cursor to trace on the function in Y2. What does it mean that the point (8, 7) also exists on this function?

```
Y2=-9+2X

X=8        /Y=7
```
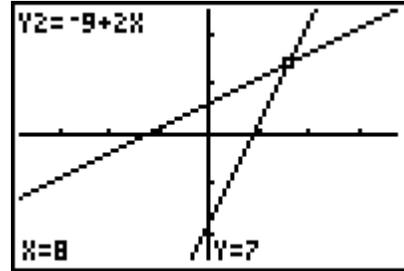
Next examine the table. Press 2nd GRAPH. Arrow down to find the *x*-value that gives the same *y*-value for both functions. This point, (8, 7), is the solution to this system of linear equations.

```
 X  │ Y1  │ Y2
 2  │ 4   │ -5
 3  │ 4.5 │ -3
 4  │ 5   │ -1
 5  │ 5.5 │ 1
 6  │ 6   │ 3
 7  │ 6.5 │ 5
 8  │ 7   │ 7
X=8
```

Use the **intersect** command (found in the **Calc** menu) to find the exact solution. Choose each curve, then guess where the intersection point is.

```
Intersection
X=8          /Y=7
```
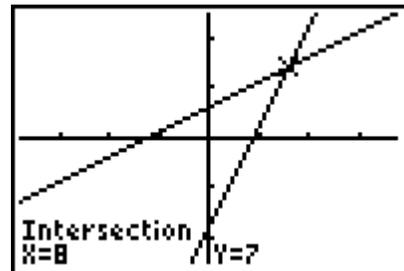
Examine the system of the two equations shown here.

```
Plot1  Plot2  Plot3
\Y1■7+2.5X
\Y2■35.9-6X
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

Set this friendly window. Later you can explore setting the best friendly window for a certain system.

```
WINDOW
 Xmin=-28.2
 Xmax=28.2
 Xscl=5
 Ymin=-18.6
 Ymax=18.6
 Yscl=5
 Xres=1
```

View the graph. Estimate where the solution occurs.
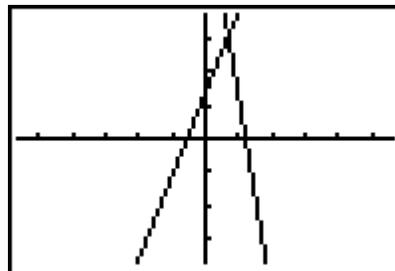
Next examine the table. This time you will notice that no *x*-value gives the same *y*-value for both functions. However, what happens between *x* = 3 and *x* = 4?

It is possible to "zoom in" on this section of the table. Press [2nd] [WINDOW]. To examine the part of the table between 3 and 4, change the **TblStart** to 3. You need to count by a smaller amount than 1. Try changing the **ΔTbl** (change in table) to 0.1.

Press [2nd] [GRAPH] to return to the table. Notice that the top value of *x* is 3 and *x* increases by 0.1 in each row. Do you see an *x*-value that gives the same *y*-value in each function?

Press [GRAPH] and [TRACE]. If you trace you will not be able to land exactly on *x* = 3.4.

Algebra 1
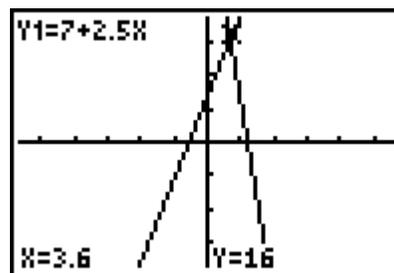
Since you know *x* = 3.4 is the desired point, you can type
③ · ④ ⟨ENTER⟩ while in trace mode to jump exactly to that
value of *x*.
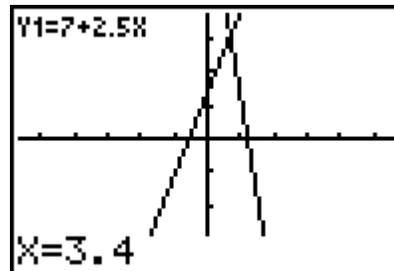
Use the **intersect** command (found in the **Calc** menu) to find
the exact solution.
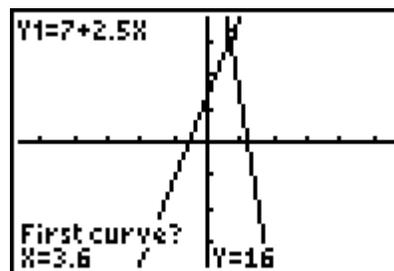
Try other systems, like *y* = 2*x* + 7 and *y* = −3 + 2*x*. You can
also examine systems that include a function that is not linear.