Intersecting the Solution

ID: 11517

Time Required
15 minutes

Activity Overview

In this teacher-led activity, students will learn to solve systems of equations graphically. They will learn the relationship between the algebraic and graphical solutions and create equations that draw upon this connection.

Topic: Linear Systems

- *Solving systems of equations*
- *Graphical solutions*

Teacher Preparation and Notes

- *Problem 2 should be completed in pairs so students can gain additional practice with algebraic techniques.*
- *Students should know how to solve systems of equations using the substitution method before beginning this activity. Students' knowledge of elimination is helpful, but not necessary.*
- *This activity can be paperless. The student TI-Nspire document contains directions and a place to record their answers. However, the teacher should follow up each part of the activity with the discussion questions in the document to deepen student understanding.*
- *If the teacher wants the activity to be student-centered, add the discussion questions to the student worksheet, or place the questions in the student TI-Nspire document.*
- ***To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "11517" in the keyword search box.***

Associated Materials

- *LinearSystems_Student.doc*
- *LinearSystems.tns*
- *LinearSystems_Soln.tns*

Suggested Related Activities

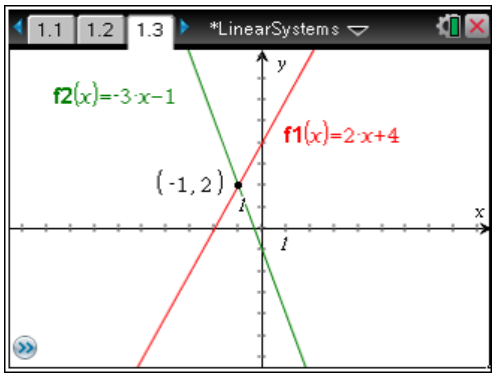
To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Solving Systems of Equations from Four Perspectives (TI-Nspire technology) — 9210*
- *Introduction to Systems of Equations (TI-Nspire technology) — 9354*
- *Bowling Anyone? Solving Systems of Equations (TI-Nspire technology) — 9215*
- *Which Garage is Better? (TI-Nspire technology) — 10078*
- *Intersections (TI-Nspire technology) — 9083*

Problem 1 – Solving a System of Linear Equations Graphically

In this problem, students will solve a system of linear equations algebraically, using substitution, and solving it graphically on the calculator. Students will see the relationship between the algebraic solution and the graphical solution.

Through solving the systems algebraically, they should discover that the values of *x* and *y* are the point of intersection (*x*, *y*) when the two lines in the system are graphed.



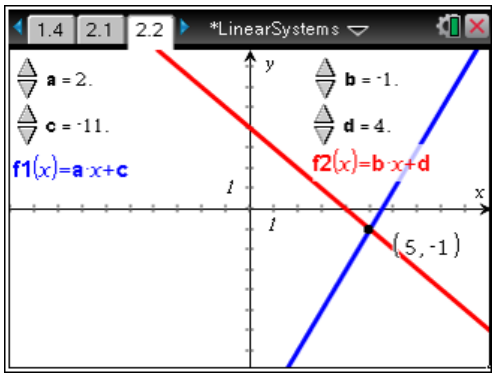
Discussion Question:

- How does the algebraic solution relate to the graph of the two lines?

Problem 2 – Creating a System of Equations

In this problem, students are given two lines and an intersection point. Students will use the sliders to adjust the lines so the solution is the given intersection point. This activity should reinforce the connection of the intersection point as the graphical form of the algebraic solution.

Encourage students to find more than one system of equations that has the solution (5, -1).



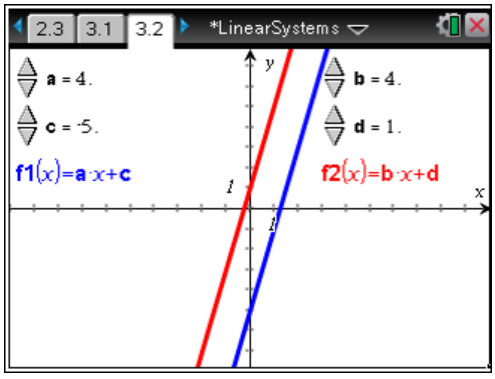
Discussion Questions:

- Did anyone find two lines with positive slopes? Negative slopes?
- Is it possible for a combination of a horizontal and a vertical line to intersect at the solution point?
- How many pairs of lines can intersect at the given solution point?

Extension – Infinite or No Solutions

For an extension, Problem 3 has two lines graphed. Have students use the up/down arrows to move the lines to represent no solutions or infinite solutions for a system of linear equations. Students should share equations that meet these conditions.

A class discussion will need to take place to verify that the equations meet the solution criteria. You should have students focus on the slopes of the lines and draw connections between the equations and the graphs.



Discussion Questions:

- What characteristics of the equations determine if the system has no solutions? Infinite solutions?
- What does the graph of a system of linear equations look like when there are no solutions? Infinite solutions?
- Is there another way to write the same equation so it is not obvious the system is the same equation?

Student Solutions:

Problem 1

$2x + 4 = -3x - 1$ $\quad y = 2x + 4$

$5x = -5$ $\quad y = 2 \cdot -1 + 4$

$x = -1$ $\quad y = 2$

Solution: $x = -1$, $y = 2$

Sample Explanation: the point where the lines meet is the same as the algebraic solution.

Problem 2

Sample solution: **f1**(x) = $2x - 11$; **f2**(x) = $-x + 4$

Problem 3

Answers will vary. No solution should be parallel lines. Infinite solutions should be same line.