Exploring Linear Equations

Work with a partner to explore each set of equations with your TI-83 graphing calculator. Look for patterns and relationships between the properties of the equations and their graphs. Be sure to sketch the graph of each equation on the coordinate grid provided.

Getting Started

a. Turn on your TI-83 graphing calculator.
b. Press [Y=] to display the Y=Editor.
c. If [Y=] is not empty, press [CLEAR]. If there are more entries in the Y=Editor, press [▼] [CLEAR] until you have cleared them all.
d. Press [WINDOW] to set the scale for the graph. Use the [▼] to enter the following values:
   
   Xmin=-9.5
   Xmax=9.5
   Xscl=1
   Ymin=-6.5
   Ymax=6.5
   Yscl=1
   Xres=1

e. Press [Y=] to display the Y=Editor. Use the keypad to enter a function. For example, to enter y = -5x + 2, press

   [(-)] 5 [X,T,Θ,n] [+ ] 2

f. To display the graph, press [GRAPH].
g. Move between the Y=Editor screen and the Graph by pressing [Y=] and [GRAPH].

Exploring the Coefficient of x

What effect do you think the coefficient of x has on a graph? In other words, if you multiply x by a number, what do you think will happen to the graph? Based on your previous experience with graphing linear equations, write a conjecture about the effect of the coefficient of x.

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Now you will investigate the effects of the coefficient of x. Enter each function and display the graph. Sketch the graphs on the grid at the right. Then answer the questions using complete sentences.

a. \(y = x\)
\(y = 2x\)
\(y = 5x\)
\(y = 10x\)
\(y = 20x\)

As the coefficient of x increases in value, what happens to the graph?

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b. \(y = -x\)
\(y = -2x\)
\(y = -5x\)
\(y = -10x\)
\(y = -20x\)

As the coefficient of x decreases in value, what happens to the graph?

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\(y = \frac{3}{4}x\)
\(y = 0.5x\)
\(y = \frac{1}{3}x\)
\(y = \frac{1}{4}x\)
\(y = 0.1x\)

As the coefficient of x gets closer and closer to zero, what happens to the graph?

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d. \( y = (-3/4)x \)
\( y = -0.5x \)
\( y = (-1/3)x \)
\( y = (-1/4)x \)
\( y = -0.1x \)

As the coefficient of \( x \) gets closer and closer to zero, what happens to the graph?

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e. **Conclusions:** What effect did the \textbf{coefficient of } \( x \) have on the graph? As the value increased, what happened to the graph? What if the value decreased? What effect did a negative value have on the graph?

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Exploring the Constant Term

What effect do you think the adding or subtracting of a \textbf{constant term} has on a graph? In other words, if you add or subtract a number, what do you think will happen to the graph? Based on your previous experience with graphing linear equations, write a conjecture about the effect of the constant term.

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Now you will investigate the effects of the **constant term**. Enter each function and display the graph. Sketch the graphs on the grid at the right. Then answer the questions using complete sentences.

a. $y = x$
   $y = x + 1$
   $y = x + 3$
   $y = x + 5$

   What effect does adding a positive number have on the graph of $y = x$??

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b. $y = x$
   $y = x - 1$
   $y = x - 3$
   $y = x - 5$

   What effect does subtracting a positive number (or adding a negative number) have on the graph of $y = x$??

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c. **Conclusions**: What effect did the **constant term** have on the graph? If a value was added, what happened to the graph? What if a value was subtracted?

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