Chapter 3: Linear Functions

- 3-1 Graphing Linear Equations using a table
- 3-2 Graphing Linear Equations using x and y intercepts
- 3-2b Graphing Linear Equations Using a TI-84 Calculator
- 3-3 Slope

- Mid-Chapter Review
Today we will:
- Identify linear equations, intercepts, and zeros.
- Graph Linear Functions.

<table>
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<tr>
<th>Linear Equation</th>
<th>Standard Form</th>
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Let's look at several examples of linear equations and some that are not linear:

\[ x - 3y = 2 \]
\[ y = \frac{2}{3}x + 3 \]
\[ \frac{1}{x} + y = 9 \]
\[ 5x + 4y = 12 \]
\[ xy = -3 \]
\[ x^2 - 2x - 3 = y \]
**Linear Rules**

- Both variables must have the exponent of 1.
- An equation cannot be linear if... (more details)

**You Try**

Determine whether the following equations represent a linear function; if not, please explain why it is not linear.

**Graphs of Equations**

A graph is a picture of the relationship between two variables, in our case, the variables x and y. The graph of a linear equation is a line. The line is made up of a series of points. You can use the equation to determine these points. Graph the following equations by using at least three points on the line.

1. $y = 3x - 4$
2. $y = -2x + 1$
Practice

3-1 Graphing Lines Using a Table

\[ y = x + 3 \]

\[ y = -2x \]

\[ y = -2x - 2 \]

\[ y = 3x + 1 \]
**What’s an Intercept?**

**DEFINE IT**

**You Try**

Determine the x and y-intercept for the following linear functions:

**EX.1** \(3x - 4y = 12\)

**EX.2** \(2x + 3y = 6\)

**Graphs of Equations**

A graph is a picture of the relationship between two variables, in our case, the variables \(x\) and \(y\). The graph of a linear equation is a line. The line is made up of a series of points. The \(x\) and \(y\) intercepts are two points on the line that can be used to graph it.

The \(x\) intercept is -2 and the \(y\)-intercept is 3.

\(7x - 7y = 14\)
Practice

\[-x + y = 5\]

\[-2x - 3y = 12\]

\[x + 2y = 8\]

\[-2x + y = -6\]
Slope (vertical change over horizontal change) is represented by the letter “m.”

\[ m = \frac{\text{"rise"}}{\text{"run"}} \]

The slope of a line can be determined from a table, by \__________ units on a coordinate plane, or by \__________ coordinates.

Find the slope of each line below.

The slope of a horizontal line is \__________.

The slope of a vertical line is \__________.

Remember: \__________ are \__________ movements; \__________ are \__________ movements.

Steep slopes have greater
Graph four different lines, all with different negative slopes. Show each slope and compare steepness.

Slopes will be represented with fractions with a greater

Sketch a sample (or a few) of each type of slope. Add a skier if you want! It may help you remember the direction and whether the values are increasing or decreasing.

Sketch it

- Positive slope
- Negative slope
- Zero slope
- Undefined slope

Order from steepest to least steep: 1/3, 3, 3/2, 3/4
Rate of Change and Slope

Find the slope of the line that passes through each pair of points.

1. $(-2, 3), (-1, 0)$
2. $(3, 1), (-2, -3)$
3. $(-2, 3), (3, 3)$
4. $(6, 3), (7, -4)$
5. $(-9, -3), (-7, -5)$
6. $(6, -2), (5, -4)$
7. $(7, -4), (4, 8)$
8. $(-7, 8), (-7, 5)$
9. $(5, 9), (3, 9)$
10. $(15, 2), (-6, 5)$
11. $(3, 9), (-2, 8)$
12. $(-2, -5), (7, 8)$
13. $(12, 10), (12, 5)$
14. $(0.2, -0.9), (0.5, -0.9)$
15. $\left(\frac{7}{3}, \frac{4}{3}\right), \left(-\frac{1}{3}, \frac{2}{3}\right)$

Find the value of $r$ so the line that passes through each pair of points has the given slope.

16. $(-2, r), (6, 7), m = \frac{1}{2}$
17. $(-4, 3), (r, 5), m = \frac{1}{4}$
18. $(-3, -4), (-5, r), m = -\frac{9}{2}$
19. $(-5, r), (1, 3), m = \frac{7}{6}$
20. $(1, 4), (r, 5), m$ undefined
21. $(-7, 2), (-8, r), m = -5$
22. $(r, 7), (11, 8), m = -\frac{1}{5}$
23. $(r, 2), (5, r), m = 0$

24. ROOFING The pitch of a roof is the number of feet the roof rises for each 12 feet horizontally. If a roof has a pitch of 8, what is its slope expressed as a positive number.
Graph the following functions, given their equations in y = mx + b form.

- \( y = -2x + 4 \)
- \( y = 3x - 1 \)
- \( y = 2x + 4 \)
- \( y = 3x - 1 \)

Graph the following functions, given a point and its slope.

- \((1, 2), m = -1\)
- \((-2, 3), m = 2/3\)
Treasure Hunt with Slopes

Using the definition of slope, draw segments with the slopes listed below in order. A correct solution will trace the route to the treasure.

1. 3   2. $\frac{1}{4}$   3. $-\frac{2}{5}$   4. 0
5. 1   6. $-1$   7. no slope   8. $\frac{2}{7}$
9. $\frac{3}{2}$   10. $\frac{1}{3}$   11. $-\frac{3}{4}$   12. 3