Bellwork

Which function is linear?

a. \( f(x) = x^2 \)  

b. \( g(x) = 2.7 \)

c. \( f(x) = \sqrt{9 - x^2} \)

d. \( g(x) = \sqrt{x - 1} \)

If \( f(x) = (3x + 7)^2 \), then \( f(1) = ? \)

A. 10  B. 16  C. 58  D. 79  E. 100

Homework Key

p. 9

27) 8

31) 13

33) \( \sqrt{61} \)

58) About 45 yds
1.2-1.3: Graphing Equations and Lines

**GOAL:** graph equations, identify types of symmetry.

Write the equation of the line using point-slope form.

### Graphing Equations

**Example 1:** Complete the table then sketch the graph of the equation

\[ y = x^2 - 2 \]

<table>
<thead>
<tr>
<th>x</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>(-1)</td>
<td>(-1)</td>
<td>(1)</td>
<td>(5)</td>
</tr>
<tr>
<td>(x, y)</td>
<td>((-1, -1))</td>
<td>((0, -1))</td>
<td>((1, 0))</td>
<td>((2, 3))</td>
</tr>
</tbody>
</table>
Finding x- and y- intercepts

To find x-intercepts:

1. Let $y = 0$ and solve for $x$

To find y-intercepts:

1. Let $x = 0$ and solve for $y$

Example 2: Find the x- and y- intercepts of the graph of $y = x^3 - 4x$

x-intercepts:

$0 = x^3 - 4x$
$0 = x(x^2 - 4)$
$0 = x(x+2)(x-2)$
$x = 0, x+2 = 0, x-2 = 0$

$x = 0, -2, 2$

y-intercept:

$y = 0^3 - 4(0) = 0$

$(0, 0), (-2, 0), (2, 0)$
## Symmetry

<table>
<thead>
<tr>
<th>Symmetry</th>
<th>Algebraically</th>
<th>Graphically</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>x-axis</strong></td>
<td>Replacing y with -y yields an equivalent equation</td>
<td><img src="image" alt="Folded over x-axis" /></td>
<td>(x - y^2 = 1)  (x - (-y)^2 = 1)  (x + y^2 = 1)  (x - (y)^2 = 1)</td>
</tr>
<tr>
<td><strong>y-axis</strong></td>
<td>Replacing x with -x yields an equivalent equation</td>
<td><img src="image" alt="Folded over y-axis" /></td>
<td>(y = x^2)  (y = (-x)^2)  (y = (-x)(-x))  (y = x^2)</td>
</tr>
<tr>
<td><strong>origin</strong></td>
<td>Replacing x with -x yields an opposite equation</td>
<td><img src="image" alt="Rotation 180°" /></td>
<td>(y = \sqrt{3x})  (y = \sqrt{3x})  (y = -\sqrt{3x})</td>
</tr>
</tbody>
</table>

## Slope

Given 2 points \((x_1, y_1)\) and \((x_2, y_2)\)

\[
m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}
\]

**Example 3:** Calculate slope given two points.

\((-2, -6), (3, 5)\)

\(m = \frac{5 - (-6)}{3 - (-2)} = \frac{11}{5}\)

\((-1, 2), (2, 2)\)

\(m = \frac{2 - 2}{2 - (-1)} = \frac{0}{3} = 0\)

\((3, 4), (3, 1)\)

\(m = \frac{4 - 1}{3 - 3} = \frac{3}{0} = \text{undefined}\)
Slope-intercept form of a line

Example 4: Identify the slope and y-intercept and use them to graph the line.

\[ y = -5x + 4 \]
\[ y = \frac{2}{3}x - 6 \]

Point-slope form of a line

If \((x_1, y_1)\) is a point on a line slope \(m\) and \((x, y)\) is any other point on the line, then...

\[ y - y_1 = m(x - x_1) \]

Example 5: Write the equation of the line with a slope of \(\frac{2}{3}\) passing through \((6, -4)\).

\[ m = \frac{2}{3} \]
\[ (x_1, y_1) = (6, -4) \]

\[ y + 4 = \frac{2}{3}(x - 6) \]
\[ y + 4 = \frac{2}{3}x - 4 \]
\[ -4 = \frac{2}{3}x - 8 \]
\[ y = \frac{2}{3}x - 8 \]
Point – Slope Form of a Line

Example 6: Write the equation of the line through the points (-2, 0) and (3, 1).

\[
\text{Slope} \quad m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 0}{3 - (-2)} = \frac{1}{5}
\]

\[
y - 0 = \frac{1}{5}(x + 2) \quad \Rightarrow \quad y = \frac{1}{5}x + \frac{2}{5}
\]

Parallel and Perpendicular Lines

Parallel lines:  \( \text{Slopes are equal} \)

Perpendicular lines:  \( \text{slopes are opposite reciprocal} \)

\[
\frac{3}{4} \quad \Rightarrow \quad -\frac{4}{3}
\]

Example 7: Write the equation of the line passing through the point \( (2, -1) \) and (a) parallel and (b) perpendicular to \( 2x - 3y = 5 \).

\[
-\frac{2}{3}x = -\frac{2x}{3} + \frac{5}{3} \quad \Rightarrow \quad y = \frac{2}{3}x - \frac{5}{3}
\]

(a) \( m = \frac{2}{3} \) \quad \( y + 1 = \frac{2}{3}(x - 2) \)

(b) \( m = -\frac{3}{2} \) \quad \( y + 1 = -\frac{3}{2}(x - 2) \)
1.2-1.3 assignment

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p. 33 # 19, 24, 25, 33, 34, 53, 56, 65, 70, 87

*find slope*