8.6 Group Work and some review problems for test 3 (answers start on page 5)

You need to stay in class and work on this in order to earn your participation points for the day. I will take attendance during the last few minutes of class.

1. Determine whether each relation represents a function.
   a. \( \{(3,5),(3,7),(3,9)\} \)  
   b. \( \{(5,3),(7,3),(9,3)\} \)

2. If \( g(x) = -x^2 + 1 \), evaluate the following.
   a. \( g(3) \)  
   b. \( g(0) \)  
   c. \( g(-2) \)  
   d. \( g(a) \)

3. If \( h(x) = 25x^2 \), solve \( h(x) = 9 \).
4.

![Graph of y = k(x)](image)

On the graph in Figure 1, if $x = 0$, then $y = _____.$

Find $k(-3)$

Find $k(-1)$

Find $k(4)$

If $k(x) = -6$, then $x = ________________.$

Solve $k(x) = -3$.

In Table 1, $f(2) = _____.$

Find $f(0)$

Solve $f(x) = 8$.

Solve $f(x) = 2$. 

Table 1: $y = f(x)$

<table>
<thead>
<tr>
<th>$x$</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td>-1</td>
<td>-4</td>
</tr>
</tbody>
</table>
5. Find the domain and the range of the function.

Figure 1: \( y = k(x) \)

The domain of \( k(x) \) is ___________________________

The range of \( k(x) \) is ___________________________

6. Find the domain and the range of the function.

Figure 2: \( y = p(x) \)

The domain of \( p(x) \) is ___________________________

The range of \( p(x) \) is ___________________________
7. Does the graph represent a function? Circle yes or no for each graph.

Yes  No

Yes  No

Yes  No

Yes  No

8. An anthropologist can estimate the height of a male or a female given the lengths of certain bones. A humerus is the bone from the elbow to the shoulder. The height, in centimeters, of a female with a humerus of length \( x \) centimeters is given by \( H(x) = 2.75x + 71.48 \). If a humerus is known to be from a female, how tall was the female if the bone is 32 cm long?
MTH 65 - some problems to help you review for test 3

For problems 1 – 12, factor completely or state that the polynomial is prime.

1. \( x^3 - 9x \)
2. \( x^2 - 3x - 108 \)
3. \( 50x^4y + 40x^3y^2 + 8x^2y^3 \)
4. \( 16x^2 + 25 \)
5. \( 2y^3 + y^2 - 18y - 9 \)
6. \( 18x^5y^3 - 6x^4y^2 + 10x^3y^3 \)
7. \( 32x^2 - 52x - 45 \)
8. \( 4x^2 + 16 \)
9. \( 9x^2 - 72x + 144 \)
10. \( x^2 - 5x - 6 \)
11. \( y^3 + 4y^2 - 5y - 20 \)
12. \( 10x^2 + 11x - 6 \)

For problems 13 – 26, solve each quadratic equation. Write your answer in a sentence.

13. \( 4x^2 = 16 \)
14. \( x^2 - 8x = 20 \)
15. \( 4x(x + 3) = -9 \)
16. \( 3x^2 + x - 10 = 0 \)
17. \( (x + 5)(x - 4) = 10 \)
18. \( (5y + 3)^2 = 25 \)
19. \( x^2 + 12x + 4 = 0 \)
20. \( 2x^2 - 4x + 3 = 0 \)
21. \( 5x^2 + 2x + 1 = 0 \)
22. \( 4x^2 + 25 = 0 \)
23. \( (x - 1)(x + 4) = -4 \)
24. \( 10x^2 + 3 = 11x \)
25. \( (3x + 2)^2 = 6 \)
26. \( 2x^2 - 4x - 1 = 0 \)

For problems 27 – 32, find the indicated root or simplify, if possible.

27. \( -\sqrt{49} \)
28. \( \sqrt{-16} \)
29. \( \sqrt{45} \)
30. \( \sqrt{-12} \)
31. \( \frac{\sqrt{21}}{\sqrt{3}} \)
32. \( \sqrt{75} \)

33. Rationalize the denominator. \( \frac{\sqrt{5}}{\sqrt{3}} \)
34. Graph \( y = 3x - x^2 \)
35. Graph \( y = x^2 + 4x + 3 \)
36. Graph \( y = 2(x - 3)^2 + 1 \)

37. A piece of wire measuring 20 feet is attached to a telephone pole as a guy wire. The distance along the ground from the bottom of the pole to the end of the wire is 4 feet greater than the height where the wire is attached to the pole. How far up the pole does the guy wire reach? Draw a picture. Label it. Define your variable (include unit). Set up and solve an algebraic equation. Write your answer in a complete sentence.

Group Work Answers
1. a. \( \{(3,5),(3,7),(3,9)\} \) doesn’t represent a function.
   
b. \( \{(5,3),(7,3),(9,3)\} \) represents a function.
2. a. \( g(3) = -3^2 + 1 \)
   \[ = -9 + 1 \]
   \[ = -8 \]

   b. \( g(0) = -0^2 + 1 \)
   \[ = 1 \]

   c. \( g(-2) = -(-2)^2 + 1 \)
   \[ = -4 + 1 \]
   \[ = 3 \]

   d. \( g(a) = -a^2 + 1 \)

3. Substituting 9 for \( h(x) \) gives \( 9 = 25x^2 \).
\[
\frac{9}{25} = \frac{25x^2}{25}
\]
\[
\frac{9}{25} = x^2
\]
\[
\pm \sqrt{\frac{9}{25}} = x
\]
\[
x = \pm \frac{3}{5}
\]

4. On the graph in Figure 1, if \( x = 0 \), then \( y = 3 \).
   \( k(-3) = 6 \)
   \( k(-1) = 0 \)
   \( k(4) = 3 \)

If \( k(x) = -6 \), then \( x = 1 \).

The solution to \( k(x) = -3 \) is \(-6, 0, \) or \( 6 \).

In Table 1, \( f(2) = -1 \).
   \( f(0) = 5 \)

The solution to \( f(x) = 8 \) is \(-1 \).

The solution to \( f(x) = 2 \) is \( 1 \).

5. The domain of \( k(x) \) is \([-6, 6]\). The range of \( k(x) \) is \([-6, 6]\).

6. The domain of \( p(x) \) is \((-\infty, \infty)\). The range of \( p(x) \) is \([-4, \infty]\).

7. Yes Yes

8. The female with a humerus that is 32 cm long is 159.48 cm tall.
Review Answers

1. \(x(x + 3)(x - 3)\)

2. \((x - 12)(x + 9)\)

3. \(2x^2y(5x + 2y)^2\)

4. prime

5. \((2y + 1)(y + 3)(y - 3)\)

6. \(2x^3 y^2 \left(9x^2y - 3x + 5y\right)\)

7. \((8x + 5)(4x - 9)\)

8. \(4\left(x^2 + 4\right)\)

9. \(9(x - 4)^2\)

10. \((x - 6)(x + 1)\)

11. \((y^2 - 5)(y + 4)\)

12. \((5x - 2)(2x + 3)\)

13. The solution is \(-2\) or 2.

14. The solution is \(-2\) or 10.

15. The solution is \(-\frac{3}{2}\).

16. The solution is \(-2\) or \(\frac{5}{3}\).

17. The solution is \(-6\) or 5.

18. The solution is \(-\frac{8}{5}\) or \(\frac{2}{5}\).

19. The solution is \(-6 \pm 4\sqrt{2}\).

20. The solution is \(\frac{2 \pm i\sqrt{2}}{2}\).

21. The solution is \(\frac{-1 \pm 2i}{\frac{5}{2}}\).

22. The solution is \(\frac{5}{2}i\).

23. The solution is \(-3\) or 0.

24. The solution is \(\frac{1}{2}\) or \(\frac{3}{5}\).

25. The solution is \(\frac{-2 \pm \sqrt{6}}{3}\).

26. The solution is \(\frac{2 \pm \sqrt{6}}{2}\).

27. \(-7\)

28. \(4i\)

29. \(3\sqrt{5}\)

30. \(2i\sqrt{3}\)

31. \(\sqrt{7}\)

32. \(5\sqrt{5}\)

33. \(\frac{\sqrt{15}}{3}\)

34. Figure 1: \(y = 3x - x^2\)

35. Figure 2: \(y = x^2 + 4x + 3\)
36. Table 1: \( y = 2(x - 3)^2 + 1 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>19</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>19</td>
</tr>
</tbody>
</table>

Figure 3: \( y = 2(x - 3)^2 + 1 \)

37. Let \( h \) represent the distance (in feet) from the top of the wire on the pole to the ground.

The Pythagorean Theorem tells us \( h^2 + (h + 4)^2 = 20^2 \).

\[
\begin{align*}
  h^2 + (h + 4)^2 &= 20^2 \\
  h^2 + (h + 4)(h + 4) &= 400 \\
  h^2 + h^2 + 4h + 4h + 16 &= 400 \\
  2h^2 + 8h + 16 - 400 &= 400 - 400 \\
  2h^2 + 8h - 386 &= 0 \\
  2\left(h^2 + 4h - 192\right) &= 0 \\
  2(h + 16)(h - 12) &= 0 \\
  h + 16 &= 0 \text{ or } h - 12 = 0 \\
  h &= -16 \text{ or } h = 12
\end{align*}
\]

Since a distance can’t be negative, we discard \(-16\). The guy wire reaches 12 feet up the pole.