Section 10.1 Extra Practice

1. For each pair of functions, determine \( h(x) = f(x) + g(x) \).
   a) \( f(x) = \sqrt{x - 4} \), \( g(x) = 12 \)
   b) \( f(x) = 2x + 7 \), \( g(x) = 5x - 11 \)
   c) \( f(x) = x^2 - 3x - 2 \), \( g(x) = x^2 - x + 5 \)
   d) \( f(x) = (x + 4)^2 \), \( g(x) = -7x + 1 \)

2. Consider the functions \( f(x) = 3x - 5 \) and \( g(x) = x^2 + 1 \).
   a) Determine the equation of the function \( h(x) = (f + g)(x) \).
   b) Sketch the graphs of \( f(x) \), \( g(x) \), and \( h(x) \) on the same set of axes.
   c) State the domain and range of \( h(x) \).

3. For each pair of functions, determine \( h(x) = f(x) - g(x) \).
   a) \( f(x) = 10 \), \( g(x) = |x + 3| \)
   b) \( f(x) = 2x - 5 \), \( g(x) = x + 8 \)
   c) \( f(x) = x^2 + x + 8 \), \( g(x) = 2x^2 - 3x \)
   d) \( f(x) = 4x - 6 \), \( g(x) = (x - 2)^2 \)

4. Consider the functions \( f(x) = (x + 1)^2 \) and \( g(x) = 3x \).
   a) Determine the equation of the function \( h(x) = (f - g)(x) \).
   b) Sketch the graphs of \( f(x) \), \( g(x) \), and \( h(x) \) on the same set of axes.
   c) State the domain and range of \( h(x) \).

5. Given \( f(x) = x^2 - 6 \), \( g(x) = \sqrt{x - 2} \), and \( h(x) = 2x - 1 \), find each combined function and state its domain and range.
   a) \( y = (f + g)(x) \)
   b) \( y = (g - h)(x) \)
   c) \( y = (h - g)(x) \)
   d) \( y = (f + h)(x) \)

6. Consider \( f(x) = x^2 - 7 \) and \( g(x) = 4x + 5 \).
   a) Determine \( h(x) = f(x) + g(x) \), and then find \( h(2) \).
   b) Determine \( m(x) = f(x) - g(x) \), and then find \( m(1) \).
   c) Determine \( p(x) = g(x) + f(x) \), and then find \( p(1) \).

7. Use the graphs of \( f(x) \) and \( g(x) \) to evaluate each of the following.
   a) \( (f + g)(4) \)
   b) \( (f + g)(-1) \)
   c) \( (f + g)(-4) \)
   d) \( (f + g)(-5) \)

8. Sketch the graph of \( h(x) = (f - g)(x) \) given the graphs of \( f(x) \) and \( g(x) \).

9. If \( h(x) = (f + g)(x) \) and \( f(x) = 3x - 4 \), determine \( g(x) \).
   a) \( h(x) = x^2 + 5x - 2 \)
   b) \( h(x) = \sqrt{x - 7} + 1 \)
   c) \( h(x) = \frac{9x + 15}{3} \)
   d) \( h(x) = 2x^2 - 7x + 4 \)

10. The cost to rent a facility for an event is $2500 plus $14 per person. Tickets to the event cost $65.
   a) Write equations to represent the total cost, \( C \), and the total revenue, \( R \), as functions of the number, \( n \), of people.
   b) Graph \( C(n) \) and \( R(n) \) on the same set of axes.
   c) How many people must attend for the organizers of the event to break even?
Section 10.2 Extra Practice

1. For each pair of functions, determine $h(x) = f(x)g(x)$.
   a) $f(x) = x + 3 \quad g(x) = 2x - 5$
   b) $f(x) = 2x - 3 \quad g(x) = 3x + 1$
   c) $f(x) = \sqrt{x - 4} \quad g(x) = x + 2$
   d) $f(x) = \sqrt{x + 1} \quad g(x) = \sqrt{3 - x}$

2. Consider the functions $f(x) = x - 4$ and $g(x) = x + 4$.
   a) Determine the equation of $h(x) = (f \cdot g)(x)$.
   b) Sketch the graphs of $f(x)$, $g(x)$, and $h(x)$ on the same grid.
   c) State the domain and range of $h(x)$.

3. Determine $h(x) = \frac{f(x)}{g(x)}$, and then state the domain and range of $h(x)$.
   a) $f(x) = x + 3 \quad g(x) = 2x - 5$
   b) $f(x) = 2x - 3 \quad g(x) = 3x + 1$
   c) $f(x) = \sqrt{x - 4} \quad g(x) = x + 2$
   d) $f(x) = \sqrt{x + 1} \quad g(x) = \sqrt{3 - x}$

4. Consider the functions $f(x) = x^2 - 9$ and $g(x) = x - 3$.
   a) Determine the equation of the function $h(x) = f(x)g(x)$.
   b) Sketch the graphs of $f(x)$, $g(x)$, and $h(x)$ on the same grid.
   c) State the domain and range of $h(x)$.

5. Given $f(x) = x + 1$, $g(x) = 2x + 1$, and $h(x) = 2x^2 + 7x + 3$, determine each combined function and state its domain and range.
   a) $y = (f \cdot g)(x)$
   b) $y = (f \cdot h)(x)$
   c) $y = \frac{g(x)}{f(x)}$
   d) $y = \frac{h(x)}{g(x)}$

6. For each pair of functions $f(x)$ and $g(x)$,
   a) determine $h(x) = (f \cdot g)(x)$
   b) sketch the graphs of $f(x)$, $g(x)$, and $h(x)$ on the same grid
   c) state the domain and range of $h(x)$
   a) $f(x) = x^2 + 4x + 3 \quad g(x) = x - 5$
   b) $f(x) = x - 4 \quad g(x) = x^2 - 16$
   c) $f(x) = \frac{1}{x - 3} \quad g(x) = \frac{1}{x + 1}$

7. Use the graphs of $f(x) = -x^2 + 5$ and $g(x) = -2x + 1$ to determine each value.

8. For each pair of functions $f(x)$ and $g(x)$,
   a) determine $h(x) = \frac{f(x)}{g(x)}$
   b) sketch the graphs of $f(x)$, $g(x)$, and $h(x)$ on the same grid
   c) state the domain and range of $h(x)$
   a) $f(x) = x^2 + 6x + 8 \quad g(x) = x + 4$
   b) $f(x) = \frac{1}{x + 2} \quad g(x) = \frac{1}{x - 6}$

9. If $h(x) = \frac{f(x)}{g(x)}$ and $f(x) = x^3 + 6x^2 + 11x + 6$, determine $g(x)$.
   a) $h(x) = x^2 + 3x + 2$
   b) $h(x) = x^2 + 4x + 3$

10. Given $f(x) = x + 1$, $g(x) = x - 5$, and $h(x) = x - 4$, determine each combined function.
    a) $y = f(x)g(x)h(x)$
    b) $y = \frac{f(x)g(x)}{h(x)}$
    c) $y = \frac{f(x) + g(x)}{h(x)}$
Section 10.3 Extra Practice

1. Given \( f(x) = 3x - 5 \) and \( g(x) = -2x + 7 \), find each value.
   a) \( f(g(1)) \)
   b) \( f(g(-4)) \)
   c) \( g(f(-2)) \)
   d) \( g(f(3)) \)

2. Given \( f(x) = 8 - 2x \) and \( g(x) = x^2 + 3x + 4 \), find each value.
   a) \( f(g(1)) \)
   b) \( f(g(-4)) \)
   c) \( g(f(-2)) \)
   d) \( g(f(3)) \)

3. Given \( f(-1) = 7, f(7) = 5, f(3) = 0, g(-1) = 3, g(7) = -1, \) and \( g(5) = -2 \), find each value.
   a) \( f(g(7)) \)
   b) \( f(g(-1)) \)
   c) \( g(f(-1)) \)
   d) \( g(f(7)) \)

4. Use the graph to find each value.

5. If \( f(x) = 2x - 9 \) and \( g(x) = x^2 + 6 \), determine each of the following.
   a) \( f(g(a)) \)
   b) \( g(f(a)) \)
   c) \( f(g(x)) \)
   d) \( g(f(x)) \)
   e) \( f(f(x)) \)
   f) \( g(g(x)) \)

6. Consider \( f(x) = x^2 - 5 \) and \( g(x) = \sqrt{x + 2} \).
   a) Determine \( y = f(g(x)) \).
   b) Sketch the graph of \( y = f(g(x)) \).
   c) State the domain and range of \( y = f(g(x)) \).

7. Given \( f(x) = \sqrt{x + 2} \) and \( g(x) = x + 5 \), sketch the graph of each composite function. Then, determine the domain and range of each composite function.
   a) \( f(g(x)) \)
   b) \( g(f(x)) \)

8. For each pair of functions, \( f(x) \) and \( g(x) \), determine \( f(g(x)) \) and \( g(f(x)) \).
   a) \( f(x) = 3x - 1 \) \( g(x) = x^2 + 2 \)
   b) \( f(x) = x^2 - 4 \) \( g(x) = 5x + 7 \)
   c) \( f(x) = x^2 - x \) \( g(x) = x^2 + x \)
   d) \( f(x) = x^2 - 9 \) \( g(x) = \sqrt{x + 4} \)

9. If \( h(x) = (f \circ g)(x) \), determine \( g(x) \).
   a) \( h(x) = x - 4 \) and \( f(x) = x^2 \)
   b) \( h(x) = x^2 + 6x + 5 \) and \( f(x) = x^2 - 4 \)

10. A manufacturer’s weekly production of office chairs can be modelled by the function \( N(t) = 100 + 25t \), where \( t \) is the time in years since 2001, and \( N \) is the number of chairs. The size of the manufacturer’s workforce can be modelled by the composite function \( W(N) = 3\sqrt{N} \).
    a) Write an equation that represents the size of the workforce as a function of time.
    b) Determine the domain and range of the function from part a).
    c) What was the size of the workforce in 2011? How many office chairs were manufactured in that year?
## Chapter 10 Study Guide

This study guide is based on questions from the Chapter 10 Practice Test in the student resource.

<table>
<thead>
<tr>
<th>Question</th>
<th>I can …</th>
<th>Help Needed</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>write the equation of a function that is the sum or difference of two functions</td>
<td>☐ some ☐ none</td>
<td>10.1 Example 1</td>
</tr>
<tr>
<td>#2</td>
<td>determine the domain and range of a function that is the product or quotient of two functions</td>
<td>☐ some ☐ none</td>
<td>10.2 Example 2</td>
</tr>
<tr>
<td>#3</td>
<td>evaluate a function that is the sum, difference, product, or quotient of two functions</td>
<td>☐ some ☐ none</td>
<td>10.1 Examples 2, 3 10.2 Example 2</td>
</tr>
<tr>
<td>#4</td>
<td>determine values of a composite function</td>
<td>☐ some ☐ none</td>
<td>10.3 Example 1</td>
</tr>
<tr>
<td>#5</td>
<td>write the equation of a composite function and explain any restrictions</td>
<td>☐ some ☐ none</td>
<td>10.3 Examples 2, 3</td>
</tr>
<tr>
<td>#6</td>
<td>write the equation of a function that is the sum, difference, product, or quotient of two functions</td>
<td>☐ some ☐ none</td>
<td>10.1 Examples 1, 2 10.2 Examples 1, 2</td>
</tr>
<tr>
<td>#7</td>
<td>write the equation of a function that is the sum, difference, or composition of two functions</td>
<td>☐ some ☐ none</td>
<td>10.1 Example 1 10.3 Examples 2–4</td>
</tr>
<tr>
<td>#8</td>
<td>determine the equation and the domain and range of a function that is the product or quotient of two functions</td>
<td>☐ some ☐ none</td>
<td>10.2 Example 1</td>
</tr>
<tr>
<td>#9</td>
<td>sketch the graph of a function that is the sum, difference, product, or quotient of two functions</td>
<td>☐ some ☐ none</td>
<td>10.1 Examples 2, 3 10.2 Example 2</td>
</tr>
<tr>
<td>#10</td>
<td>determine the equation and the domain and range of a composite function</td>
<td>☐ some ☐ none</td>
<td>10.3 Examples 2, 3</td>
</tr>
<tr>
<td>#11</td>
<td>write the equation of a composite function and determine values of a composite function</td>
<td>☐ some ☐ none</td>
<td>10.3 Example 5</td>
</tr>
<tr>
<td>#12</td>
<td>sketch the graph of a function that is the product or quotient of two functions</td>
<td>☐ some ☐ none</td>
<td>10.2 Example 3</td>
</tr>
<tr>
<td>#13</td>
<td>determine the equation and sketch the graph of a function that is the sum, difference, product, or quotient of two functions</td>
<td>☐ some ☐ none</td>
<td>10.1 Examples 1, 2 10.2 Example 2 10.3 Example 3</td>
</tr>
<tr>
<td>#14</td>
<td>write the equation of a composite function, explain any restrictions, and evaluate the function</td>
<td>☐ some ☐ none</td>
<td>10.3 Example 5</td>
</tr>
</tbody>
</table>
Chapter 10 Test

Multiple Choice
For #1 to #5, select the best answer.

1. From the graph, what is the value of \((f - g)(2)\)?
   \[\text{A} \quad -3 \quad \text{B} \quad 0 \quad \text{C} \quad 2 \quad \text{D} \quad 4\]

2. Given \(f(x) = x^2 + 2\) and \(g(x) = x - 5\), which equation represents \(h(x) = (f + g)(x)\)?
   \[\text{A} \quad h(x) = 2x^2 - 5 \quad \text{B} \quad h(x) = x^2 + x - 3 \quad \text{C} \quad h(x) = x^2 + x - 5 \quad \text{D} \quad h(x) = x^2 + 2x - 5\]

3. Let \(f(x) = x - 1\) and \(g(x) = x^2 - 1\). Determine the non-permissible values of \(y = \left(\frac{f}{g}\right)(x)\).
   \[\text{A} \quad 1 \quad \text{B} \quad -1 \quad \text{C} \quad \pm 1 \quad \text{D} \quad \text{none}\]

4. If \(f(x) = \sqrt{3x - 1}\) and \(g(x) = x^2\), which is the domain of \(m(x) = \frac{f(x)}{g(x)}\)?
   \[\text{A} \quad \{x \mid x > 0, x \in \mathbb{R}\} \quad \text{B} \quad \{x \mid x \neq 0, x \in \mathbb{R}\} \quad \text{C} \quad \{x \mid x > \frac{1}{3}, x \in \mathbb{R}\} \quad \text{D} \quad \{x \mid x \neq \frac{1}{3}, x \in \mathbb{R}\}\]

5. Consider the functions \(f(x) = x^2 + 2\) and \(g(x) = -|x + 1|\). Which statement is true?
   \[\text{A} \quad \frac{f(x)}{g(x)} > 0, x \neq -1 \quad \text{B} \quad f(x) - g(x) < 0 \quad \text{C} \quad f(x) > g(x) \quad \text{D} \quad (g \cdot f)(x) > 1\]

Short Answer

6. Given \(f(x) = \sqrt{x}\) and \(g(x) = 4 - x\), match the combined function in set A with the graph in set B.
   
   Set A
   i) \((f - g)(x)\)    \(\quad\) ii) \((f + g)(x)\)
   iii) \(f(x)g(x)\)    \(\quad\) iv) \(\left(\frac{f}{g}\right)(x)\)

Set B
A.       
B.       
C.       
D.       

7. Use the table to evaluate each expression:

<table>
<thead>
<tr>
<th>$x$</th>
<th>$f(x)$</th>
<th>$g(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

a) $f(g(1))$
b) $(g \circ f)(3)$
c) $\left(\frac{f}{g}\right)(5)$
d) $(g \circ g)(1)$

8. Given the functions $f(x) = \frac{1}{x}$ and $g(x) = \frac{1}{x - 1}$, determine the equation of the combined function $h(x)$. Then state the domain of $h(x)$.

a) $h(x) = (f + g)(x)$
b) $h(x) = (f - g)(x)$
c) $h(x) = f(x)g(x)$
d) $h(x) = \left(\frac{f}{g}\right)(x)$

9. Let $f(x) = x + 1$, $g(x) = x^2 + 1$, and $h(x) = 1 - x$. Determine each equation.

a) $q(x) = f(x) + h(x)$
b) $p(x) = g(f(x))$

10. Find two functions, $f(x)$ and $g(x)$, such that $f(g(x)) = (2x + 3)^2 - 5$.

Extended Response

11. Consider the functions $f(x) = x^2$ and $g(x) = 2^x$.

a) Determine the equation of $h(x) = \frac{f(x)}{g(x)}$,

and state the domain of $h(x)$.

b) How does the graph of $h(x)$ behave for large values of $x$?

12. Assume $f(x) = x$ and $g(x) = |x|$.

a) Determine the equation of $h(x) = \frac{3f(x) + g(x)}{f(x)}$.

b) Sketch the graph of $h(x)$.

c) State the domain and range of $h(x)$.

13. If $f(x) = x^2$ and $h(x) = x + 1$, then $g(x) = 3(f(h(x))) - 5$.

a) Determine an equation for $g(x)$.

b) Describe $g(x)$ as a transformation of $f(x)$.

14. Let $h(x) = \cos x$ and $g(x) = \frac{1}{x}$. Determine

the composite functions $h(g(x))$ and $g(h(x))$, and state their domains.

15. Angular speed is the rate at which the central angle is changing. Suppose a bicycle wheel with diameter 700 mm makes 30 revolutions in $t$ seconds.

a) Write an equation for the angular speed, $v$, as a function of time $t$.

b) Write an equation for angular speed, $v$, as a function of time $t$, if $t$ is increased by 1 s.

c) Combine your functions to write an equation for the change in angular speed when time increases by 1 s.
Chapter 10 BLM Answers

BLM 10–1 Prerequisite Skills

1. a) 28  b) −3  c) 3  d) \( \frac{3}{8} \)
   e) \(-x^3 - 3x^2 - x + 2\)
2. a) \(2x - 4\)  b) \(-4x^2 - x - 1\)
   c) \(4x^2 - 5x + 4\)  d) \(4x^3 - 3x^2 - 8\)
3. a) \(-x + 2\)  b) 2
   c) \(x^2 - 5x + 8\)  d) \(-5x^2 + 5x - 1\)
4. Two; depending on the order of subtraction
5. a) \(3x^3 - x^2 + x\)  b) \(-12x^3\)
   c) \(3x^2 - 22x + 7\)  d) \(4x^2 + 4x + 1\)
   e) \(x^3 - x^2 + x + 3\)  f) \(3x^3 - 6x^2 + 12x - 8\)
6. a) \(x \neq -3; x \neq 2\)  b) \(x \neq \frac{1}{3}; x + 1\)
   c) \(x \neq 1; 2x - 1\)
7. a) \(y = 2x - 5\)  b) \(y = -3x + 1\)
   c) \(y = -3x - 5\)  d) \(y = -4x + 2\)
8. a) \(y = x^3 + x - 6\)
   b) \(y = -x^2 + 2x - 1\)
9. a) 0, 1, 2
   b) domain: \(\{x | x \in \mathbb{R}\}\); range: \(\{y | y \in \mathbb{R}\}\)
10. a) \(a = 1, b = -3, c = -4\)
   b) \(p(x) = (x + 2)(x + 1)(x - 4)\)
11. a) translation of 3 units down
   b) reflection in the x-axis
   c) translation of 1 unit to the right
12. a) \(y = f(x) - 3\)  b) \(y = -f(x)\)
   c) \(y = f(x - 1)\)

BLM 10–2 Section 10.1 Extra Practice

1. a) \(h(x) = \sqrt{x - 4} + 12\)
   b) \(h(x) = 7x - 4\)
   c) \(h(x) = 2x^2 - 4x + 3\)
   d) \(h(x) = x^2 + x + 17\)
2. a) \(h(x) = x^2 + 3x - 4\)
   b) \(g(x) = 2x^2 + x + 3\)
   c) domain: \(\{x | x \in \mathbb{R}\}\); range: \(\{y | y \geq -6.25, \in \mathbb{R}\}\)
3. a) \(h(x) = 10 - |x + 3|\)  b) \(h(x) = x - 13\)
   c) \(h(x) = -x^2 + 4x + 8\)  d) \(h(x) = -x^2 + 8x - 10\)
4. a) \(h(x) = x^2 - x + 1\)
   b) \(g(x) = x^2 + 2x + 2\)
   c) domain: \(\{x | x \in \mathbb{R}\}\); range: \(\{y | y \geq 0.75, y \in \mathbb{R}\}\)
5. a) \(y = x^2 + \sqrt{x - 2} - 6, domain: \{x | x \geq 2, x \in \mathbb{R}\}\); range: \(\{y | y \geq -2, y \in \mathbb{R}\}\)
   b) \(y = \sqrt{x - 2} - 2x + 1; domain: \{x | x \geq 2, x \in \mathbb{R}\};
   range: \(\{y | y \leq 2\frac{7}{8}, y \in \mathbb{R}\}\) Note: The actual range is difficult to determine from the graph, and the best estimate for range may be \(\{y | y \leq -3, y \in \mathbb{R}\}\).
   c) \(y = 2x - \sqrt{x - 2} - 1; domain: \{x | x \geq 2, x \in \mathbb{R}\};
   range: \(\{y | y \leq 2\frac{7}{8}, y \in \mathbb{R}\}\) Note: The actual range is difficult to determine from the graph, and the best estimate for range may be \(\{y | 3 \leq y, y \in \mathbb{R}\}\)
   d) \(y = x^2 + 2x - 7, domain: \{x | x \in \mathbb{R}\};
   range: \(\{y | y \geq -8, y \in \mathbb{R}\}\)
6. a) \(h(x) = x^2 + 4x - 2; 10\)
   b) \(m(x) = x^2 - 4x - 12; 15\)
   c) \(p(x) = x^2 + 4x - 2; 3\)
7. a) 4  b) 6  c) 8  d) 8
8. 
9. a) \(g(x) = x^2 + 2x + 2\)
   b) \(g(x) = \sqrt{x - 7} - 3x + 5\)
   c) \(g(x) = 9\)
   d) \(g(x) = 2x^2 - 10x + 8\)
10. a) \(C(n) = 2500 + 14n\)
    \(R(n) = 65n\)
   b) \(C(n)\)
   c) 50 people
BLM 10–3 Section 10.2 Extra Practice

1. a) \( h(x) = 2x^2 + x - 15 \)
   b) \( h(x) = 6x^2 - 7x - 3 \)
   c) \( h(x) = x \sqrt{x - 4} + 2 \sqrt{x - 4} \)
   d) \( h(x) = \left( \sqrt{x + 1} \right) \left( \sqrt{3 - x} \right) \)

2. a) \( h(x) = x^2 - 16 \)

3. a) \( h(x) = \frac{x + 3}{2x - 5} \); domain: \( \left\{ x \mid x \neq \frac{5}{2}, x \in \mathbb{R} \right\} \);
   range: \( \left\{ y \mid y \neq \frac{1}{2}, y \in \mathbb{R} \right\} \)
   b) \( h(x) = \frac{2x - 3}{3x + 1} \); domain: \( \left\{ x \mid x \neq -\frac{1}{3}, x \in \mathbb{R} \right\} \);
   range: \( \left\{ y \mid y \neq \frac{2}{3}, y \in \mathbb{R} \right\} \)
   c) \( h(x) = \frac{\sqrt{x - 4}}{x + 2} \); domain: \( \left\{ x \mid x \geq 4, x \in \mathbb{R} \right\} \);
   range: \( \left\{ y \mid 0 \leq y \leq \frac{\sqrt{6}}{12}, y \in \mathbb{R} \right\} \)
   d) \( h(x) = \frac{\sqrt{x + 1}}{\sqrt{3 - x}} \); domain: \( \left\{ x \mid -1 \leq x < 3, x \in \mathbb{R} \right\} \);
   range: \( \left\{ y \mid 0 \leq y, y \in \mathbb{R} \right\} \)

4. a) \( h(x) = x + 3, x \neq 3 \)

5. a) \( y = 2x^2 + 3x + 1 \); domain: \( \left\{ x \mid x \in \mathbb{R} \right\} \);
   range: \( \left\{ y \mid y \geq -0.125, y \in \mathbb{R} \right\} \)
   b) \( y = 2x^3 + 9x^2 + 10x + 3 \);
   domain: \( \left\{ x \mid x \in \mathbb{R} \right\} \);
   range: \( \left\{ y \mid y \in \mathbb{R} \right\} \)

6. a) \( h(x) = x^3 - x^2 - 17x - 15 \)
   
   \begin{tabular}{c}
   \textbf{BLM 10–7} \\
   (continued)
   \end{tabular}
8. a) \( h(x) = x + 2 \)

\[
\text{domain: } \{x \mid x \neq -4, x \in \mathbb{R}\}; \text{ range: } \{y \mid y \neq -2, y \in \mathbb{R}\}
\]

b) \( h(x) = \frac{x - 6}{x + 2} \)

\[
\text{domain: } \{x \mid x \neq -2, 6, x \in \mathbb{R}\}; \text{ range: } \{y \mid y \neq -2, 1, 6, y \in \mathbb{R}\}
\]

9. a) \( g(x) = x + 3 \)   b) \( g(x) = x + 2 \)

10. a) \( y = x^3 - 8x^2 + 11x + 20 \)

b) \( y = \frac{x^2 - 4x - 5}{x - 4} \)   c) \( y = \frac{2x - 4}{x - 4} \)

**BLM 10–6 Chapter 10 Test**

1. a) 10   b) 40   c) 29   d) -1
2. a) -8   b) -8   c) 184   d) 14
3. a) 7   b) 0   c) -1   d) -2
4. a) 4   b) 6   c) 5   d) 3
5. a) \( y = 2a^2 + 3 \)

b) \( y = 4a^2 - 36a + 87 \)

c) \( y = 2x^2 + 3 \)

d) \( y = 4x^2 - 36x + 87 \)

e) \( y = 4x - 27 \)

f) \( y = x^4 + 12x^2 + 42 \)

6. a) \( y = x - 3 \)

b) \( y = f(g(x)) \)

c) domain: \( \{x \mid x \geq -2, x \in \mathbb{R}\}; \text{ range: } \{y \mid y \geq -5, y \in \mathbb{R}\} \)

b) \( y = f(g(x)) \)

domain: \( \{x \mid x \geq -7, x \in \mathbb{R}\}; \text{ range: } \{y \mid y \geq 0, y \in \mathbb{R}\} \)

8. a) \( f(g(x)) = 3x^2 + 5 \)

b) \( f(g(x)) = 9x^2 - 6x + 3 \)

9. a) \( g(x) = \sqrt{x - 4} \)   b) \( g(x) = x + 3 \)

10. a) \( W(N(t)) = 3\sqrt{100 + 25t} \)

b) domain: \( \{t \mid t \geq 0, t \in \mathbb{R}\}; \text{ range: } \{W \mid W \geq 30, W \in \mathbb{R}\} \)

c) 57 workers; 350 chairs

11. a) \( h(x) = \frac{x^2}{2^x}; \ x \in \mathbb{R} \)

b) as \( x \) increases, \( h(x) \) approaches 0

12. a) \( h(x) = \frac{3|x|}{x} \)

b) [Graph of \( h(x) \) shown]

c) domain: \( \{x \mid x \neq 0, \ x \in \mathbb{R}\} \);
range: \( \{y \mid y \neq 2, 4; \ y \in \mathbb{R}\} \)

13. a) \( g(x) = 3(x + 1)^2 - 5 \) or \( g(x) = 3x^2 + 6x - 2 \)

b) vertically stretched by a factor of 3 about the 
\( x \)-axis, translated left 1 and translation down 5

14. a) \( h(g(x)) = \cos \left( \frac{1}{x} \right) \); domain: \( \{x \mid x \neq 0, \ x \in \mathbb{R}\} \)

b) \( g(h(x)) = \sec x \); domain: \( \{x \mid x \neq \frac{\pi}{2} + \pi n, \ n \in \mathbb{I}, \ x \in \mathbb{R}\} \)

15. a) \( v(t) = \frac{60\pi}{t} \)

b) \( v(t + 1) = \frac{60\pi}{t + 1} \)

c) change in angular speed = \( \frac{60\pi}{t} - \frac{60\pi}{t + 1} \), or \( \frac{60\pi}{t^2 + t} \)