

3. Let $f(x) = 3x - 2$ and $g(x) = 2x + 1$. Determine the equation of each combined function.

a) $(f + g)(x) =$

b) $(f - g)(x) =$

c) $(g - f)(x) =$

4. Let $f(x) = x^2 - 3x$ and $g(x) = |2x|$. Determine the value of each combined function.

a) $(f + g)(-4) =$

b) $(f - g)(6) =$

c) $(g - f)(1) =$

5. Let $f(x) = 5x^2$ and $g(x) = \sqrt{x^2 - 4}$. Determine each combined function and state its domain.

a) $y = (f + g)(x)$

Domain:

b) $y = (f - g)(x)$

Domain:

c) $y = (g - f)(x)$

Domain:

9. If $f(x) = 2x + 3$, $g(x) = -x^2 + 5$, and $h(x) = -x$, determine each combined function.

a) $y = f(x) + g(x) + h(x)$

b) $y = f(x) - g(x) - h(x)$

c) $y = h(x) + f(x) - g(x)$

10. If $h(x) = (f + g)(x)$ and $f(x) = 4x - 7$, determine $g(x)$.

a) $h(x) = x^2 - 2x$

b) $h(x) = 4 - x$

c) $h(x) = -2x^2 + x + 1$

Practise

1. Determine $h(x) = f(x) \cdot g(x)$ and $k(x) = \frac{f(x)}{g(x)}$ for each pair of functions.

a) $f(x) = 2x - 1$ and $g(x) = 2x - 3$

$$h(x) =$$

$$k(x) =$$

b) $f(x) = 3x$ and $g(x) = -x^2 - 4$

$$h(x) =$$

$$k(x) =$$

c) $f(x) = \sqrt{4-x}$ and $g(x) = 5x - 1$

$$h(x) =$$

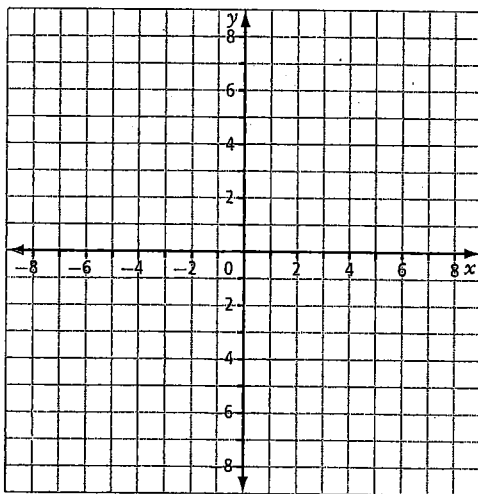
$$k(x) =$$

4. Consider the functions $f(x) = 2x - 1$ and $g(x) = (x + 1)^2$.

a) Determine $h(x) = f(x) \cdot g(x)$.

b) Determine $k(x) = \frac{f(x)}{g(x)}$.

c) $f(x)$, $h(x)$, and $k(x)$. Sketch the graph on the grid below.



d) Determine the domain and range of each combined function.

$h(x)$: Domain:

Range:

$k(x)$: Domain:

Range:

5. Evaluate each combined function using $f(x) = (x^2 + 1)$ and $g(x) = -2x$.

a) $(f \circ g)(5) =$

b) $\left(\frac{f}{g}\right)(-2) =$

c) $\left(\frac{g}{f}\right)(2) =$

6. Given $f(x) = x^2$, $g(x) = 4x - 5$, and $h(x) = \sqrt{x-1}$, determine each combined function. State any restrictions on x .

a) $y = f(x) \cdot g(x) \cdot h(x)$

b) $y = \frac{g(x) \cdot h(x)}{f(x)}$

7. If $h(x) = f(x) \cdot g(x)$ and $f(x) = 2 - x$, determine $g(x)$. State any restrictions on x .

a) $h(x) = x^2 - 2x$

b) $h(x) = \sqrt{x^2 - 4}$

8. If $h(x) = \frac{f(x)}{g(x)}$ and $g(x) = -2x$, determine $f(x)$. State any restrictions on x .

a) $h(x) = x^2 + 6x$

b) $h(x) = -x - 3$

10.3

2. If $f(x) = x + 6$ and $g(x) = -3x + 5$, determine each of the following.

a) $f(g(-4))$

b) $g(f(0))$

c) $g(g(8))$

d) $f(f(-1))$

3. Determine $(f \circ g)(x)$ and $(g \circ f)(x)$ for each pair of functions.

a) $f(x) = \sqrt{x+4}$ and $g(x) = x^2$

$(f \circ g)(x) =$

$(g \circ f)(x) =$

b) $f(x) = |x-4|$ and $g(x) = 3-x$

$(f \circ g)(x) =$

$(g \circ f)(x) =$

c) $f(x) = \frac{1}{x}$ and $g(x) = x+3$

$(f \circ g)(x) =$

$(g \circ f)(x) =$

5. If $h(x) = (f \circ g)(x)$, determine $g(x)$.

a) $h(x) = \frac{1}{(x-2)^2}$ and $f(x) = \frac{1}{x^2}$

b) $h(x) = \sqrt{x^2-2}$ and $f(x) = \sqrt{x}$

c) $h(x) = x^2 - 10x + 25$ and $f(x) = x^2$

6. For $f(x) = \sqrt{x-4}$ and $g(x) = 3x + 1$, determine each composite function and state its domain.

a) $(f \circ g)(x)$

b) $(g \circ f)(x)$

8. Consider $h(x) = \frac{1}{x}$ and $k(x) = x^2$.

a) How are $h(k(x))$ and $k(h(x))$ related?

b) What restrictions are placed on the domain of the composite functions?

Chapter 10 Review

10.1 Sums and Differences of Functions, pages 325–334

1. Given $f(x) = 2x - 1$ and $g(x) = x^2 + 4$, determine each of the following.

a) $(f + g)(-3) =$

b) $(f - g)(4)$

2. Let $f(x) = \sqrt{x+6}$ and $g(x) = 4x^2 - 1$.

a) Determine $h(x) = f(x) + g(x)$.

d) Determine $k(x) = f(x) - g(x)$.

3. If $h(x) = (f - g)(x)$ and $f(x) = -x + 6$, determine $g(x)$.

a) $h(x) = 4x^2 - 12x + 9$

b) $h(x) = \sqrt{x} + x - 6$

10.2 Products and Quotients of Functions, pages 335–344

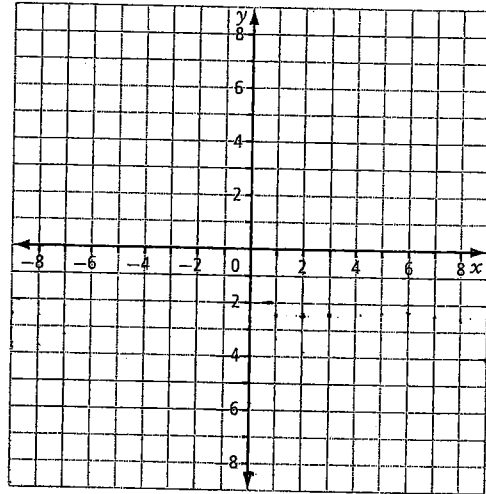
5. Let $f(x) = 1 - 2x$ and $g(x) = x^2 + 3$. Determine each combined function and state any restrictions on x .

a) $h(x) = f(x) \cdot g(x)$

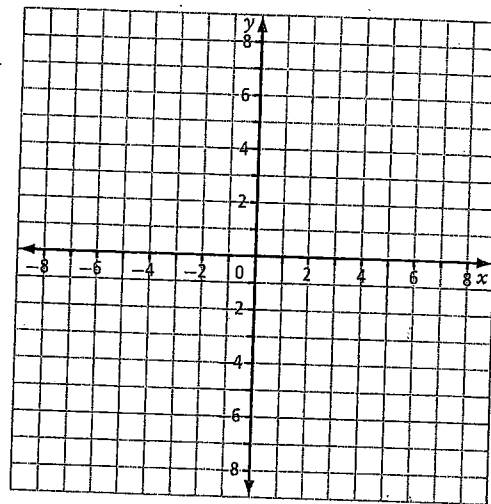
b) $k(x) = \frac{g(x)}{f(x)}$

7. Consider $f(x) = \frac{1}{x-1}$ and $g(x) = x$.

a) Determine $h(x) = (f \cdot g)(x)$. Then, sketch the graph of $y = h(x)$ and state its domain.



b) Determine $k(x) = \left(\frac{f}{g}\right)(x)$. Then, sketch the graph of $y = k(x)$ and state its domain.



8. If $h(x) = f(x) \cdot g(x)$ and $f(x) = 2x - 3$, determine $g(x)$.

a) $h(x) = 2x^2 - 5x + 3$

b) $h(x) = 2x(\sin x) - 3(\sin x)$

c) $h(x) = -2x^3 + 3x^2$

10.3 Composite Functions, pages 345–355

10. Let $f(x) = x - 3$ and $g(x) = 1 - x^2$. Determine each of the following.

a) $(f \circ g)(x)$

b) $(g \circ g)(x)$

c) $(f \circ g)(-3)$

d) $(g \circ g)(2)$

12. Given that $h(x) = (f \circ g)(x)$, determine $g(x)$.

a) $h(x) = \sqrt{9 - x}$ and $f(x) = \sqrt{x}$

b) $h(x) = \frac{12}{(7x - 2)^2}$ and $f(x) = \frac{12}{x^2}$

c) $h(x) = 4x^2 - 20x + 25$ and $f(x) = x^2$

Answers

Chapter 10

10.1 Sums and Differences of Functions,

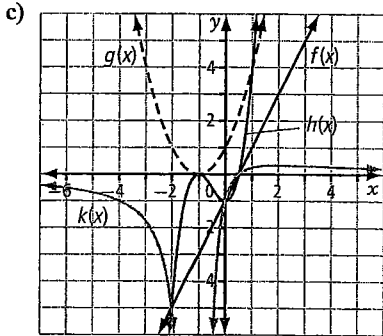
3. a) $(f + g)(x) = 5x - 1$
b) $(f - g)(x) = x - 3$
c) $(g - f)(x) = -x + 3$
4. a) 36 b) 6 c) 4
5. a) $y = 5x^2 + \sqrt{x^2 - 4}$; $\{x \mid x \leq -2 \text{ and } x \geq 2, x \in \mathbb{R}\}$
b) $y = 5x^2 - \sqrt{x^2 - 4}$; $\{x \mid x \leq -2 \text{ and } x \geq 2, x \in \mathbb{R}\}$
c) $y = \sqrt{x^2 - 4} - 5x^2$; $\{x \mid x \leq -2 \text{ and } x \geq 2, x \in \mathbb{R}\}$
9. a) $y = -x^2 + x + 8$ b) $y = x^2 + 3x - 2$
c) $y = x^2 + x - 2$
10. a) $g(x) = x^2 - 6x + 7$ b) $g(x) = -5x + 11$
c) $g(x) = -2x^2 - 3x + 8$

Chapter 10 Review, pages 356–362

10.2 Products and Quotients of

1. a) $h(x) = 4x^2 - 8x + 3; k(x) = \frac{2x-1}{2x-3}, x \neq \frac{3}{2}$
 b) $h(x) = -3x^3 - 12x; k(x) = \frac{3x}{-x^2-4}$
 c) $h(x) = (5x-1)(4-x); k(x) = \frac{\sqrt{4-x}}{5x-1}, x \neq \frac{1}{5}$

4. a) $h(x) = 2x^3 + 3x^2 - 1$
 b) $k(x) = \frac{2x-1}{x^2+2x+1}, x \neq -1$



d) $h(x)$: domain: $\{x \mid x \in \mathbb{R}\}$, range: $\{y \mid y \in \mathbb{R}\}$;
 $k(x)$: domain: $\{x \mid x \neq -1, x \in \mathbb{R}\}$,
 range $\{y \mid y \leq 0.33, y \in \mathbb{R}\}$

5. a) -260 b) $\frac{5}{4}$ c) $-\frac{4}{5}$

6. a) $y = (4x^3 - 5x^2)(\sqrt{x-1}), x \geq 1$

b) $y = \frac{(4x-5)(\sqrt{x-1})}{x^2}, x \geq 1$

7. a) $g(x) = -x$ b) $g(x) = \frac{\sqrt{x^2-4}}{2-x}, x \leq -2$ and $x > 2$

8. a) $f(x) = -2x^3 - 12x^2, x \neq 0$

b) $f(x) = 2x^2 + 6x, x \neq 0$

10.3 Composite Functions,

2. a) 23 b) -13 c) 62 d) 11

3. a) $(f \circ g)(x) = \sqrt{x^2+4}; (g \circ f)(x) = x+4$

b) $(f \circ g)(x) = |-1-x|; (g \circ f)(x) = 3-|x-4|$

c) $(f \circ g)(x) = \frac{1}{x+3}; (g \circ f)(x) = \frac{1}{x} + 3$

5. a) $g(x) = x-2$ b) $g(x) = x^2-2$ c) $g(x) = x-5$

6. a) $(f \circ g)(x) = \sqrt{3x-3}$; domain: $\{x \mid x \geq 1, x \in \mathbb{R}\}$

b) $(g \circ f)(x) = 3\sqrt{x-4} + 1$; domain: $\{x \mid x \geq 4, x \in \mathbb{R}\}$

8. a) $h(k(x)) = k(h(x)) = \frac{1}{x^2}$ b) $x \neq 0$

1. a) 6 b) -13

2. a) $h(x) = \sqrt{x+6} + 4x^2 - 1$

d) $k(x) = \sqrt{x+6} - 4x^2 + 1$

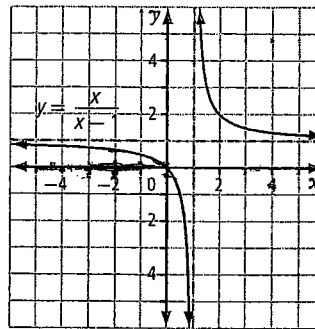
3. a) $g(x) = -4x^2 + 11x - 3$

b) $g(x) = -2x - \sqrt{x} + 12$

5. a) $h(x) = -2x^3 + x^2 - 6x + 3$

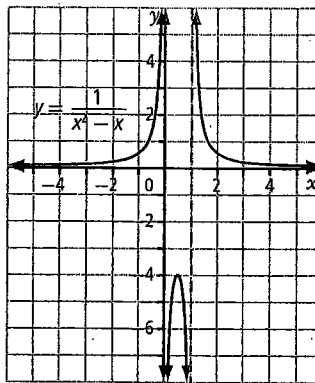
b) $k(x) = \frac{x^2+3}{1-2x}, x \neq \frac{1}{2}$

7. a) $h(x) = \frac{x}{x-1}$



domain: $\{x \mid x \neq 1, x \in \mathbb{R}\}$

b) $k(x) = \frac{1}{x^2-x}$



domain: $\{x \mid x \neq 0, 1, x \in \mathbb{R}\}$

8. a) $g(x) = x-1$ b) $g(x) = \sin x$

c) $g(x) = -x^2$