Stewart/Redlin/Watson - Precalculus 7e Chapter 2 Form A

1. If $f(x) = (x-2)^2 + 5$, find $f(2)$, $f(a)$, and $f(1/a)$.

2. Find the domain of the function.

$$f(x) = 0.5x - \frac{2}{\sqrt{x+1}}$$

3. Find the range of the function.

$$f(x) = -x^2 - 2x + 3$$

4. (a) Sketch the graph of the function $f(x) = x^2$.

(b) Use part (a) to graph the function $g(x) = (x-1)^2 + 1$.

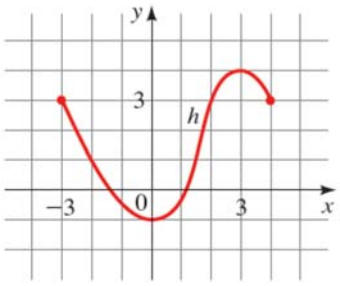
5. Describe how the graph of $y = -f(2x) + 2$ can be obtained from the graph of f.

6. Sketch the graph of the function.

$$h(x) = x^3 - 4x^2$$

7. The graph of a function *h* is given.

(a) Find $h(-3), h(-2), h(2)$, and $h(4)$
(b) Find the domain and range of *h*.
(c) Find the values of *x* for which $h(x) = 3$
(d) Find the values of *x* for which $h(x) \le 3$.



8. A function is given. Use a graphing calculator to draw the graph of *f*. Find the domain and range of *f* from the graph.

$$f(x) = x^2, \quad -3 \le x \le 5$$

9. A function is given. **(a)** Find all the local maximum and minimum values of the function and the value of *x* at which each occurs. **(b)** Find the intervals on which the function is increasing and on which the function is decreasing. State each answer correct to two decimal places.

$$G(x) = \frac{2}{x^2 + x + 1}$$

10. Evaluate $f(-2)$, $f(-1)$, $f(0)$, $f(1)$, and $f(5)$ for the piecewise-defined function.

$$f(x)=\begin{cases}3x^2 & \text{if } x<0\\ 2x+1 & \text{if } x\ge 0\end{cases}$$

11. Sketch the graph of the function.

$$f(x)=\begin{cases}x^2 & \text{if } x<-3\\ x+12 & \text{if } x\ge -3\end{cases}$$

12. Draw the graph of the function in an appropriate viewing rectangle.

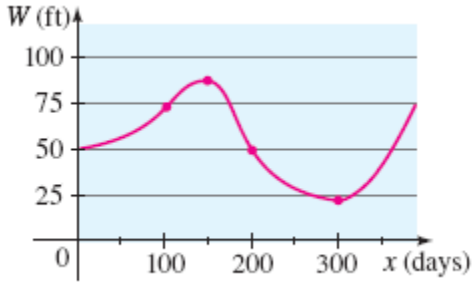
$$f(x)=1.1x^3-8.6x^2-1.4x+1.2$$

13. For the function $f(x)=2x^2-x$ determine the average rate of change between the values $x=-1$ and $x=0$.

14. For the function $f(t)=2t^2-t$ determine the average rate of change between the values $t=2$ and $t=2+h$ ($h\neq 0$).

15. Use a graphing device to draw the graph of the function $f(x)=144x^3-144x^2+36x$. State approximately the intervals on which the function is increasing and on which the function is decreasing.

16. The graph shows the depth of water W in a reservoir over a one-year period as a function of the number of days x since the beginning of the year. What was the average rate of change of W between $x = 0$ and $x = 100$?



17. If an object is dropped from a high cliff or a tall building, then the distance it has fallen after t seconds is given by the function $f(t)=16t^2$. Find its average speed (average rate of change) over the following intervals:

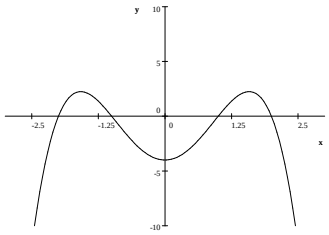
(i) Between 1 s and 6 s
(ii) Between $t=c$ and $t=c+h$

18. If $f(x)=2x^2+1$ and $g(x)=x-1$, find $f+g$, fg, and their domains.

19. Use $f(x)=3x-2$ and $g(x)=3+2x^2$ to evaluate the expression $(f\circ g)(2)$.

20. Given $f(x) = \dfrac{1}{x+2}$ and $g(x) = \dfrac{1}{x-2}$, find $f \circ g$, $g \circ f$.

21. Determine whether the function in the figure is even, odd, or neither.



22. Determine whether or not the function $f(x) = x^2 - 3x + 2$ is one-to-one.

23. Use a graphing calculator or computer to determine whether or not the function $f(x) = 2x^3 - x$ is one-to-one.

24. Find the inverse of the function.

$f(x) = \frac{1}{2}x + 1$

25. Find the inverse of the function.

$f(x) = \sqrt{25 - x^2}$, $0 \le x \le 5$

ANSWER KEY

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1. $f(2) = (2-2)^2 + 5 = 5$

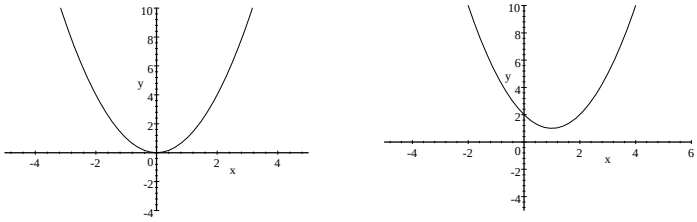
$f(a) = (a-2)^2 + 5 = 9 - 4a + a^2$

$f\left(\frac{1}{a}\right) = \left(\frac{1}{a} - 2\right)^2 + 5 = \frac{1 - 4a + 9a^2}{a^2}$

2. Domain: $(-1, \infty)$

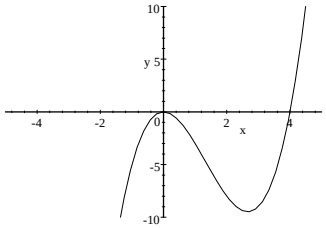
3. Range: $(-\infty, 4]$

4. (a) (b)



5. By shrinking horizontally by a factor of 1/2, then reflecting about the x -axis, then shifting 2 units up.

6.



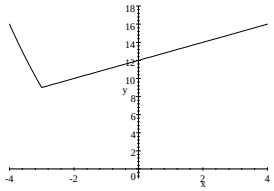
7. (a) $h(-3) = 3; h(-2) = 1; h(2) = 3; h(4) = 3$ (b) Domain $[-3, 4]$, Range $[-1, 4]$ (c) $-3, 2, 4$
(d) $-3 \le x \le 2$

8. Domain: $[-3, 5]$, Range $[0, 25]$

9. **(a)** local maximum ≈ 2.67 when $x \approx -0.50$; no local minimum **(b)** increasing on $(-\infty, -0.50]$; decreasing on $[-0.50, \infty)$

10. $f(-2) = 12$, $f(-1) = 3$, $f(0) = 1$, $f(1) = 3$, $f(5) = 11$

11.



ANSWER KEY

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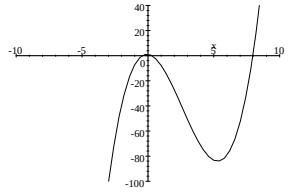
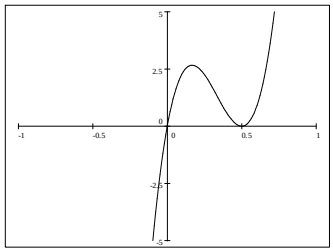
12. 

13. Average rate of change $= \dfrac{f(0)-f(-1)}{0-(-1)} = -3$

14. Average rate of change $= \dfrac{f(2+h)-f(2)}{2+h-2} = \dfrac{2(2+h)^2-8-h}{h} = 7+2h$

15. f is increasing on $\left(-\infty, \frac{1}{6}\right)$ and $\left(\frac{1}{2}, \infty\right)$, and decreasing on $\left(\frac{1}{6}, \frac{1}{2}\right)$.



16. $\approx \dfrac{1}{4}$ ft/day

17. (i) $\dfrac{f(6)-f(1)}{6-1} = 112$ ft/s , (ii) $\dfrac{f(c+h)-f(c)}{c+h-c} = \dfrac{16(c+h)^2-16c^2}{h} = 32c+16h$

18. $f+g = 2x^2+x$ domain : $(-\infty,\infty)$; $(fg)(x) = 2x^3-2x^2+x-1$, domain: $(-\infty,\infty)$.

19. $(f \circ g)(2) = 31$

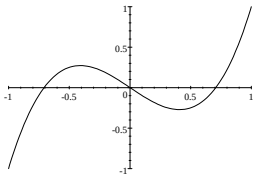
20. $(f \circ g)(x) = f\left(\dfrac{1}{x-2}\right) = \dfrac{1}{\dfrac{1}{x-2}+2} = \dfrac{x-2}{2x-3}$

$(g \circ f)(x) = g\left(\dfrac{1}{x+2}\right) = \dfrac{1}{\dfrac{1}{x+2}-2} = \dfrac{x+2}{-2x-3}$

21. even

22. $f(x) = x^2-3x+2 = (x-2)(x-1)$, so $f(2) = 0 = f(1)$, so f is not one-to-one.

23. Using a graphing calculator and the horizontal line test we see that $f(x) = 2x^3 - x$ is not one-to-one.



24. $g(x) = 2x - 2$

25. $g(x) = \sqrt{25 - x^2}$, $0 \le x \le 5$

1. For the function given, find $g(-1)$, $g(3)$, and $g(a^2)$.

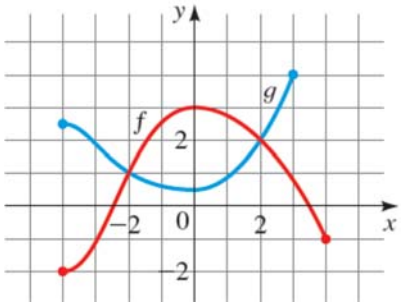
$g(x) = (1/x) + x^2$

2. Graphs of the functions f and g are given.

(a) Which is larger, $f(0)$ or $g(0)$?

(b) Which is larger, $f(-1)$ or $g(-1)$?

(c) For which values of x is $f(x) = g(x)$?



3. Find the domain of the function.

$$f(x) = \frac{x+3}{x^2-4}$$

4. A function is given. Use a graphing calculator to draw the graph of f. Find the domain and range of f from the graph.

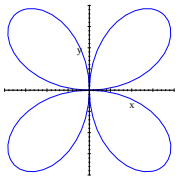
$$f(x) = -\sqrt{16-x^2}$$

5. Sketch the graph of the function $f(x) = 2 + \sqrt{x}$.

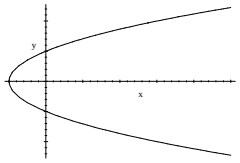
6. Determine if the equation $x^2 + y^2 - 25 = 0$ defines y as a function of x. Explain your answer.

7. Determine whether each curve represents a graph of a function.

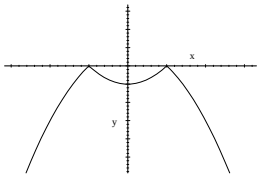
a.)



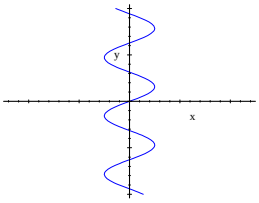
b.)



c.)



d.)



8. A function f is given, and the indicated transformations are applied to its graph (in the given order). Write the equation for the final transformed graph.

$f(x) = |x|$; shift to the left $1/2$ unit, shrink vertically by a factor of 0.2, and shift downward 2 units.

9. Sketch the graph of the piecewise defined function.

$$f(x) = \begin{cases} x+2 & \text{if } x < 0 \\ 2 & \text{if } 0 \le x \le 1 \\ 3-x & \text{if } 1 < x \end{cases}$$

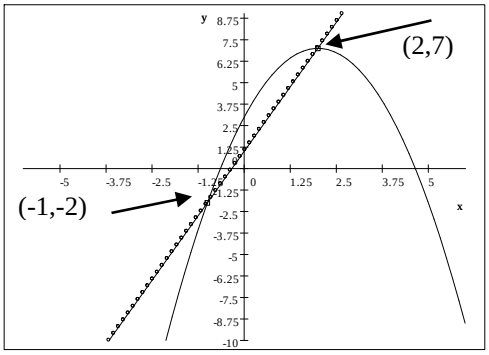
10. Sketch the graph of the function.

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

11. Use a graphing calculator to estimate the range of the function.

$f(x) = x^4 - x^3 + x^2 + 2x - 15$

12. For the given graph of a function, determine the average rate of change between the indicated values.



13. For the function $g(t) = \dfrac{1}{3t-2}$ determine the average rate of change between the values $t = 0$ and $t = a + 1$.

14. Use a graphing calculator to determine approximately the intervals on which the function is increasing, and on which f is decreasing.

$f(x) = x^4 + 6x^3 + x^2 - 24x + 16$

15. Describe how the graph of $y = -f(3x) + 4$ can be obtained from the graph of f.

16. Determine whether $f(x) = x^2 - x^6$ is even, odd, or neither.

17. If an object is dropped from a high cliff or a tall building, then the distance it has fallen after *t* seconds is given by the function $f(t) = 16t^2$. Find its average speed (average rate of change) over the following intervals:

(i) Between 2 s and 7 s
(ii) Between $t = c$ and $t = c + h$

18. A function is given. **(a)** Find all the local maximum and minimum values of the function and the value of *x* at which each occurs. **(b)** Find the intervals on which the function is increasing and on which the function is decreasing. State each answer correct to two decimal places.

$U(x) = 4\left(x^3 - x\right)$

19. Use a graphing device to draw the graph of the function $f(x) = -3 - 3x^2$. State approximately the intervals on which the function is increasing and on which the function is decreasing.

20. If $f(x) = 3x - 2$ and $g(x) = 3 + 2x^2$, find fg and $(f \circ g)(x)$.

21. Given $f(x) = 2 + x^2$ and $g(x) = \sqrt{x-1}$, find $\left(f \circ g\right)(2)$, $\left(f \circ f\right)(2)$.

22. Determine whether or not the function $f(x) = -2x^2 + 18x - 16$ is one-to-one.

23. Use a graphing calculator or computer to determine whether or not the function $f(x) = -|x| - |5 - x|$ is one-to-one.

24. Find the inverse of the function.

$f(x) = 3x + 2$

25. Find the inverse of the function.

$g(x) = x^2 - 9,\ x \geq 0$

ANSWER KEY

Stewart/Redlin/Watson - Precalculus 7e Chapter 2 Form B

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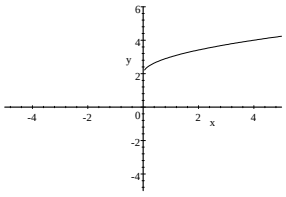
1. $g(-1) = \dfrac{1}{-1} + (-1)^2 = 0$, $g(3) = \dfrac{1}{3} + 3^2 = \dfrac{28}{3}$, $g(a^2) = \dfrac{1}{a^2} + \left(a^2\right)^2 = \dfrac{1}{a^2} + a^4 = \dfrac{1+a^6}{a^2}$

2. (a) $f(0)$ (b) $f(-1)$ (c) $-2, 2$

3. Domain: $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$

4. Domain: $[-4, 4]$, Range $[-4, 0]$

5.

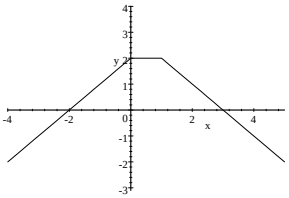


6. $x^2 + y^2 - 25 = 0 \iff y^2 = 25 - x^2 \iff y = \pm\sqrt{25 - x^2}$. No, this equation gives two values of y for a given value of x.

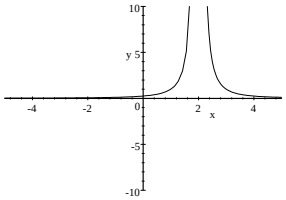
7. (a) no (b) no (c) yes (d) no

8. $f(x) = 0.2\left|x + \dfrac{1}{2}\right| - 2$

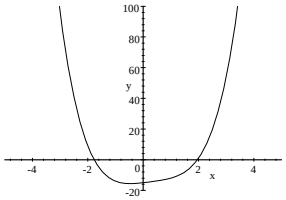
9.



10.



11. Range $[-15, \infty)$



ANSWER KEY

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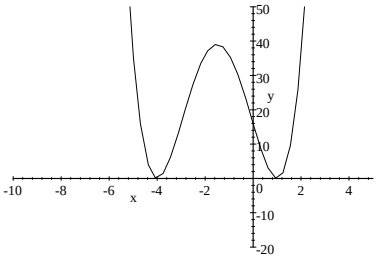
12. The average rate of change for the function between the points $(-1,-2)$ and $(2,7)$ is $\dfrac{7-(-2)}{2-(-1)}=3$.

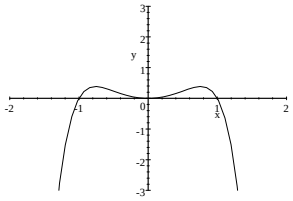
13. $\dfrac{3}{2(3a+1)}$

14. The function is increasing on $[-4,-1.5]$, $[1,\infty)$. Decreasing on $(-\infty,-4]$, $[-1.5,1)$.



15. By shrinking horizontally by a factor of $\dfrac{1}{3}$, then reflecting about the x-axis, then shifting 4 units up.

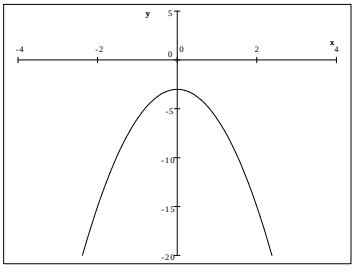
16. Since $f(x)=f(-x)$, f is even.



17. (i) $\dfrac{f(7)-f(2)}{7-2}=144\,\text{ft/s}$, (ii) $\dfrac{f(c+h)-f(c)}{c+h-c}=\dfrac{16(c+h)^2-16c^2}{h}=32c+16h$

18. **(a)** local maximum ≈ 1.54 when $x\approx -0.58$; local minimum ≈ -1.54 when $x\approx 0.58$ **(b)** increasing on $(-\infty,-0.58]\cup[0.58,\infty)$; decreasing on $[-0.58,0.58]$

19.



f is increasing on $(-\infty,0]$ and decreasing on $[0,\infty)$.

20. $fg=6x^3-4x^2+9x-6$

$(f\circ g)(x)=7+6x^2$

ANSWER KEY

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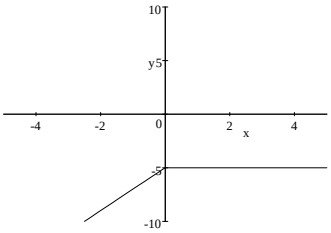
21. $(f \circ g)(2) = 3$

$(f \circ f)(2) = 38$

22. $f(x) = -2x^2 + 18x - 16 = -2(x-8)(x-1)$, so $f(8) = 0 = f(1)$, so f is not one-to-one.

23.



Using a graphing calculator and the horizontal line test we see that $f(x) = -|x| - |5 - x|$ is not one-to-one.

24. $f^{-1}(x) = \dfrac{x-2}{3}$

25. $g^{-1}(x) = \sqrt{x+9}$

1. If $g(x) = \frac{4}{x} + x^2$, find $g(-4)$.

(a) 4
(b) 6
(c) 1
(d) 15
(e) 21

2. A function is given. Use a graphing calculator to draw the graph of f. Find the domain and range of f from the graph.

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

(a) Domain: $[-3,3]$, Range: $[-3,0]$
(b) Domain: $[-9,9]$, Range: $[-9,9]$
(c) Domain: $[-3,3]$, Range: $[0,3]$
(d) Domain: $[-3,3]$, Range: all real numbers
(e) Domain: all real numbers, Range: $[0,3]$

3. Find the domain of the function.

$$f(x) = \frac{x}{x^2 - 25}$$

(a) $(-\infty, 5)$
(b) $(-\infty, -5) \cup (5, \infty)$
(c) $(-5, \infty)$
(d) $(-\infty, 0) \cup (25, \infty)$
(e) none of these

4. Evaluate $f(-1)$, $f(0)$, $f(1)$, for the piecewise-defined function.

$$f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ 2x - 1 & \text{if } x \geq 0 \end{cases}$$

(a) $f(-1) = 1$, $f(0) = -1$, $f(1) = 1$
(b) $f(-1) = -3$, $f(0) = 0$, $f(1) = 1$
(c) $f(-1) = -1$, $f(0) = 0$, $f(1) = 1$
(d) $f(-1) = 3$, $f(0) = 1$, $f(1) = -3$
(e) none of these

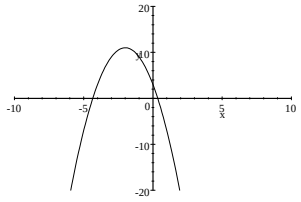
5. Determine if the equation $x^2 + y^2 = 49$ defines y as a function of x.

(a) The equation represents a function because it's a circle.
(b) The equation represents a function because for each value of x there is always two values of y.
(c) Not a function because the equation gives two values of y for a given value of x.
(d) The equation represents a function because it passes the vertical line test.
(e) Not a function because the equation passes the vertical line test.

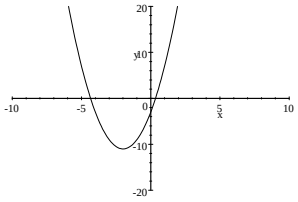
6. Sketch the graph of the function.

$h(x) = 3 - 8x - 2x^2$

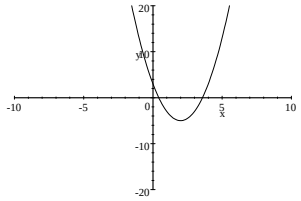
(a)



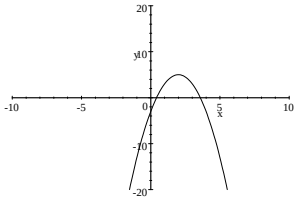
(b)



(c)

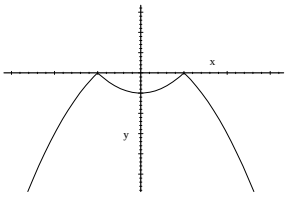


(d)



(e) none

7. Determine whether the curve represents a graph of a function.



(a) Function; the graph passes the horizontal line test.
(b) Function; the graph passes the vertical line test.
(c) Not a function; the graph passes the vertical line test
(d) Not a function; the graph passes the horizontal line test
(e) none

8. A function f is given, and the indicated transformations are applied to its graph (in the given order). Find the equation for the final transformed graph.

$f(x) = \sqrt{x}$; shift 5 units to the left, stretch vertically by a factor of 2, and reflect in the x-axis.

(a) $f(x) = -2\sqrt{x} + 5$

(b) $f(x) = -\frac{1}{2}\sqrt{x} - 5$

(c) $f(x) = -5\sqrt{x-2}$

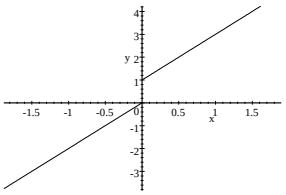
(d) $f(x) = -\sqrt{5x-2}$

(e) $f(x) = -2\sqrt{x+5}$

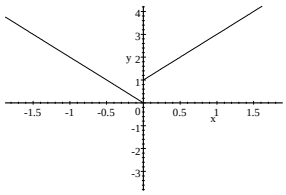
9. Sketch the graph of the function.

$$f(x)=\begin{cases}-2x & \text{if } x<0\\ 1-2x & \text{if } x\ge 0\end{cases}$$

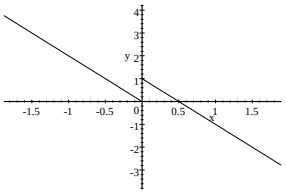
(a)



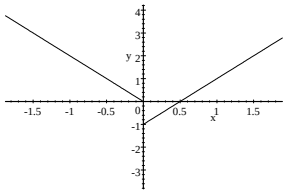
(b)



(c)



(d)



(e) none

10. Determine which viewing rectangle produces the most appropriate graph of the function.

$$g(x)=6x^3-15x^2+4x-1$$

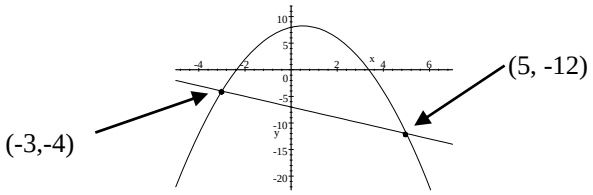
(a) $[-2,2]$ by $[-2,2]$
(b) $[-8,8]$ by $[-8,8]$
(c) $[-4,4]$ by $[-12,12]$
(d) $[-100,100]$ by $[-100,100]$
(e) $[-10,10]$ by $[-100,100]$

11. Use a graphing calculator to find, approximately the range of the function.

$$f(x)=2x^4-x^3+x^2+2x-7$$

(a) $[-2,7)$
(b) $(-\infty,\infty)$
(c) $[-14,\infty)$
(d) $[-7,\infty)$
(e) $[-\infty,7)$

12. For the given graph of a function, determine the average rate of change between the indicated values.



(a) 0 (b) 1 (c) 2 (d) –4 (e) –1

13. For the function $f(t)=\dfrac{1}{3t-2}$ determine the average rate of change between the values $t=0$ and $t=b+1$.

(a) $\dfrac{3}{(3b-1)}$

(b) $\dfrac{2}{3(b+1)}$

(c) $3(3b+1)$

(d) $\dfrac{-1}{(2b-3)}$

(e) $\dfrac{3}{2(3b+1)}$

14. Use a graphing calculator to determine approximately the internals on which the function f is decreasing.

$f(x)=x^4+6x^3+x^2-24x+16$

(a) $[-4,-1.5],\ [1,\infty)$

(b) $(-\infty,-4],\ [-1.5,1)$

(c) $(0,\infty)$

(d) $(0,-16)$

(e) $(-\infty,-16]$

15. Describe how the graph of $y=-f(3x)+4$ can be obtained from the graph of f.

(a) Shrink horizontally by a factor of $1/3$, then reflecting about the x - axis, then shifting 4 units up.

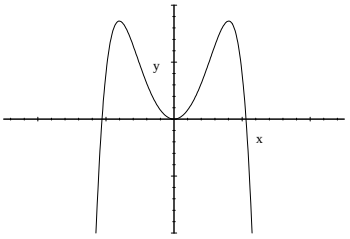
(b) Shrink horizontally by a factor of 4, then reflecting about the x - axis, then shifting 3 units up.

(c) Shrink horizontally by a factor of $1/3$, then reflecting about the y - axis, then shifting 4 units right.

(d) Shrink horizontally by a factor of $1/3$, then reflecting about the x - axis, then shifting 3 units down.

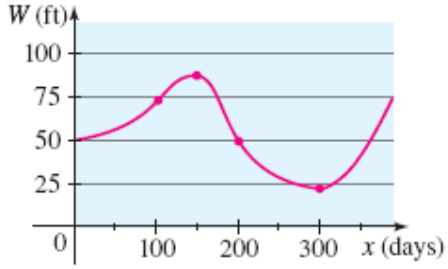
(e) Shrink horizontally by a factor of $1/3$, then reflecting about the y - axis, then shifting 4 units up.

16. Determine whether the function in the figure is even, odd, or neither.



(a) even (b) odd (c) neither even or odd (d) both even and odd

17. The graph shows the depth of water W in a reservoir over a one-year period as a function of the number of days x since the beginning of the year. Estimate the average rate of change of W between $x = 0$ and $x = 100$?



(a) -2 ft/day (b) -4 ft/day (c) 4 ft/day (d) $\frac{1}{4}$ ft/day (e) none of these

18. If an object is dropped from a high cliff or a tall building, then the distance it has fallen after t seconds is given by the function $f(t) = 16t^2$. Find its average speed (average rate of change) over the interval between $t = c$ and $t = c + h$.

(a) $-16h$ (b) $32c + 16h$ (c) $32c - h$ (d) $16c - h$ (e) none of these

19. Use a graphing device to draw the graph of the function $f(x) = -3 - 3x^2$. State approximately the interval(s) on which the function is increasing and on which the function is decreasing.

(a) f is increasing on $(-\infty, 0]$ and decreasing on $[0, \infty)$
(b) f is increasing on $(-\infty, -3)$ and decreasing on $[3, \infty)$
(c) f is increasing on $(-\infty, \infty)$
(d) f is decreasing on $[0, \infty)$ only
(e) none of these

20. If $f(x) = 3x - 2$ and $g(x) = 3 + 2x^2$, find fg and $(g \circ f)(x)$.

(a) $fg = x^3 - 4x^2 + 9x - 1$; $(g \circ f)(x) = 18x^2 - 24x + 11$
(b) $fg = 6x^3 - 4x^2 + 9x - 6$; $(g \circ f)(x) = 18x^2 - 24x + 11$
(c) $fg = 2x^2 + 3x + 1$; $(g \circ f)(x) = 6x^2 + 7$
(d) $fg = 6x^2 + 7$; $(g \circ f)(x) = 6x^3 - 4x^2 + 9x - 6$
(e) none of these

21. Given $f(x) = 2 + x^2$ and $g(x) = \sqrt{x-4}$, find $(f \circ g)(4)$

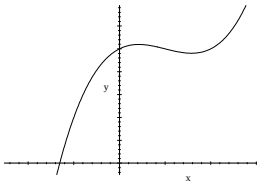
(a) $(f \circ g)(4) = 2$
(b) $(f \circ g)(4) = 4$
(c) $(f \circ g)(4) = -2$
(d) $(f \circ g)(4) = 0$
(e) $(f \circ g)(4) = 1$

22. Find $g \circ g \circ g$, where $g(x) = x^2$.

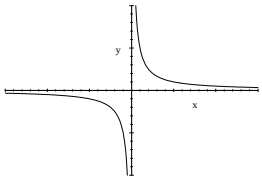
(a) x^6 (b) $6x^6$ (c) $8x^8$ (d) x^8 (e) $x^8 + 8$

23. Determine which functions are one-to-one.

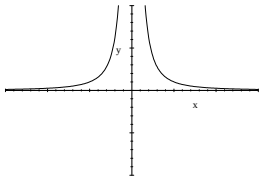
I



II



III



(a) I only (b) I, II (c) I, II, III (d) II only (e) III only

24. Find the inverse of the function.

$f(x) = 3x + 2$

(a) $f^{-1}(x) = x - 2$ (b) $f^{-1}(x) = 2x$ (c) $f^{-1}(x) = \dfrac{x+2}{3}$ (d) $f^{-1}(x) = \dfrac{x-2}{3}$ (e) none of these

25. Find the inverse of the function.

$g(x) = x^2 - 9,\ x \geq 0$

(a) $g^{-1}(x) = -\sqrt{x+9}$
(b) $g^{-1}(x) = \sqrt{x+9}$
(c) $g^{-1}(x) = 9 + \sqrt{x}$
(d) $g^{-1}(x) = 9 - \sqrt{x}$
(e) none of these

ANSWER KEY

Stewart/Redlin/Watson - Precalculus 7e Chapter 2 Form C

1. d
2. c
3. e
4. a
5. c
6. a
7. b
8. e
9. c
10. c
11. d
12. e
13. e
14. b
15. a
16. a
17. d
18. b
19. a
20. b
21. a
22. d
23. d
24. d
25. b

1. If $g(x) = 3 - \sqrt{2x-6}$, find $g(5)$.

(a) 4 (b) 3 (c) 1 (d) 5 (e) $3 - \sqrt{10}$

2. Find the range of the function.

$f(x) = \sqrt{x+4}$

(a) $[0,-2)$
(b) $(2,\infty)$
(c) $[-2,2)$
(d) $[0,\infty)$
(e) all real numbers

3. Find the domain of the function.

$f(x) = \dfrac{1}{x} + \dfrac{1}{x+1}$

(a) $(-\infty,0)$
(b) $(-\infty,-1)\cup(-1,0)\cup(0,\infty)$
(c) $(-\infty,-1)\cup(-1,0)$
(d) $(-\infty,0)\cup(0,\infty)$
(e) none of these

4. Evaluate $f(-1)$, $f(0)$, $f(1)$, for the piecewise-defined function.

$$f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ x-1 & \text{if } x \geq 0 \end{cases}$$

(a) $f(-1)=1$, $f(0)=-1$, $f(1)=0$
(b) $f(-1)=-2$, $f(0)=0$, $f(1)=1$
(c) $f(-1)=-1$, $f(0)=0$, $f(1)=1$
(d) $f(-1)=2$, $f(0)=1$, $f(1)=-3$
(e) none of these

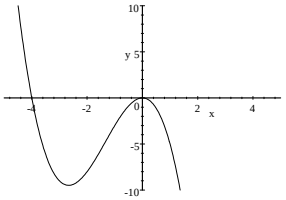
5. Determine if the equation $x^2 + (y-1)^2 = 36$ defines y as a function of x.

(a) The equation represents a function because it's a circle.
(b) The equation represents a function because for each value of x there is always two values of y.
(c) Not a function because the equation gives two values of y for a given value of x.
(d) The equation represents a function because it passes the vertical line test.
(e) Not a function because the equation passes the vertical line test.

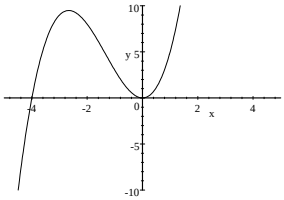
6. Sketch the graph of the function.

$h(x) = x^3 - 4x^2$

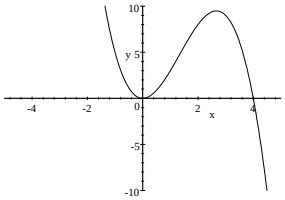
(a)



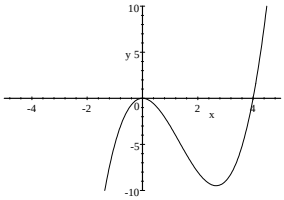
(b)



(c)

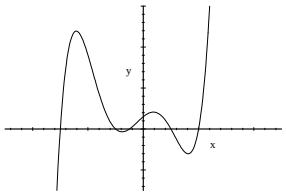


(d)



(e) none

7. Determine whether the curve represents a graph of a function.



(a) Function; the graph passes the horizontal line test.
(b) Function; the graph passes the vertical line test.
(c) Not a function; the graph passes the vertical line test
(d) Not a function; the graph passes the horizontal line test
(e) none

8. A function f is given, and the indicated transformations are applied to its graph (in the given order). Find the equation for the final transformed graph.

$f(x) = \sqrt{x}$; shift 5 units to the left, stretch vertically by a factor of 2, and reflect in the x-axis.

(a) $f(x) = -2\sqrt{x} + 5$

(b) $f(x) = -\frac{1}{2}\sqrt{x} - 5$

(c) $f(x) = -5\sqrt{x-2}$

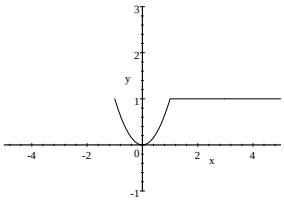
(d) $f(x) = -\sqrt{5x-2}$

(e) $f(x) = -2\sqrt{x+5}$

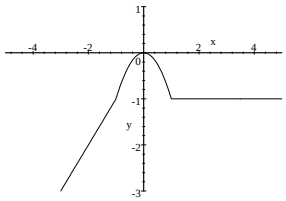
9. Sketch the graph of the function.

$$f(x)=\begin{cases}-x & \text{if} \quad x<-1\\ x^2 & \text{if} \quad -1\le x\le 1\\ 1 & \text{if} \quad x>1\end{cases}$$

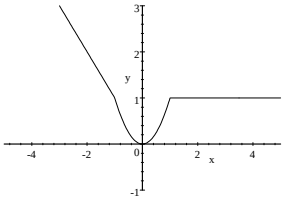
(a)



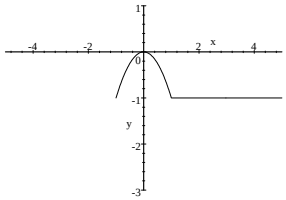
(b)



(c)



(d)



(e) none

10. Determine which viewing rectangle produces the most appropriate graph of the function.

$$g(x)=6x^3-15x^2+4x-1$$

(a) $[-2,2]$ by $[-2,2]$
(b) $[-8,8]$ by $[-8,8]$
(c) $[-4,4]$ by $[-12,12]$
(d) $[-100,100]$ by $[-100,100]$
(e) $[-10,10]$ by $[-100,100]$

11. Use a graphing calculator to find, approximately the range of the function.

$$f(x)=x^4-x^3+3x^2+2x-10$$

(a) $[0,\infty)$ (b) $(-\infty,\infty)$ (c) $[-10,10)$ (d) $[-\infty,5)$ (e) $[-10,\infty)$

12. Find the average rate of change of the function f between the points given.

$$f(x)=\frac{1}{x-3};\ x=2,\ x=7$$

(a) $1/4$ (b) $1/5$ (c) $-1/5$ (d) -4 (e) -1

13. For the function $f(t)=\frac{1}{t}$ determine the average rate of change between the values $t=a$ and $t=a+h$.

(a) $\frac{-1}{a(a+h)}$ (b) $\frac{-2}{h}$ (c) $(3h+1)$ (d) $\frac{-1}{(2h-1)}$ (e) $\frac{1}{a(a+h)}$

14. Use a graphing calculator to determine approximately the internals on which the function f is decreasing.

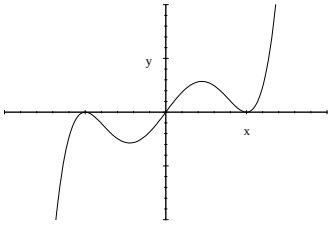
$f(x)=x^4+6x^3+x^2-24x+16$

(a) $[-4,-1.5],\ [1,\infty)$ (b) $(-\infty,-4],\ [-1.5,1)$ (c) $(0,\infty)$ (d) $(0,-16)$ (e) $(-\infty,-16]$

15. Describe how the graph of $y=-f(x)-4$ can be obtained from the graph of f.

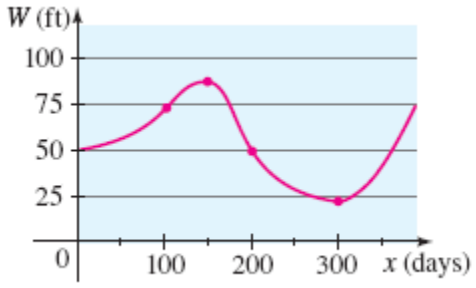
(a) Shrink horizontally by a factor of 4, then reflecting about the x - axis, then shifting 4 units up.
(b) Reflect about the x - axis, shift 4 units up.
(c) Reflect about the y - axis, shift 4 units down.
(d) Reflect about the x - axis, shift 1 unit up.
(e) Reflect about the x - axis, shift 4 units down.

16. Determine whether the function in the figure is even, odd, or neither.



(a) even
(b) odd
(c) neither even or odd
(d) both even and odd
(e) not enough information to determine

17. The graph shows the depth of water W in a reservoir over a one-year period as a function of the number of days x since the beginning of the year. Estimate the average rate of change of W between $x = 0$ and $x = 100$?



(a) –2 ft/day (b) –4 ft/day (c) 4 ft/day (d) 1/4 ft/day (e) none of these

18. If an object is dropped from a high cliff or a tall building, then the distance it has fallen after *t* seconds is given by the function $f(t) = 16t^2$. Find its average speed (average rate of change) over the interval between $t = c$ and $t = c + h$.

(a) $-16h$
(b) $32c + 16$
(c) $32c - h$
(d) $16c - h$
(e) none of these

19. Use a graphing device to draw the graph of the function $f(x) = -3 - 3x^2$. State approximately the interval(s) on which the function is increasing and on which the function is decreasing.

(a) f is increasing on $(-\infty, 0]$ and decreasing on $[0, \infty)$
(b) f is increasing on $(-\infty, -3)$ and decreasing on $[3, \infty)$
(c) f is increasing on $(-\infty, \infty)$
(d) f is decreasing on $[0, \infty)$ only
(e) none of these

20. If $f(x) = 3x - 2$ and $g(x) = 3 + 2x^2$, find fg and $(g \circ f)(x)$.

(a) $fg = x^3 - 4x^2 + 9x - 1$; $(g \circ f)(x) = 18x^2 - 24x + 11$
(b) $fg = 6x^3 - 4x^2 + 9x - 6$; $(g \circ f)(x) = 18x^2 - 24x + 11$
(c) $fg = 2x^2 + 3x + 1$; $(g \circ f)(x) = 6x^2 + 7$
(d) $fg = 6x^2 + 7$; $(g \circ f)(x) = 6x^3 - 4x^2 + 9x - 6$
(e) none of these

21. Given $f(x) = 1 - x^2$ and $g(x) = \sqrt{x - 1}$, find $(f \circ g)(5)$

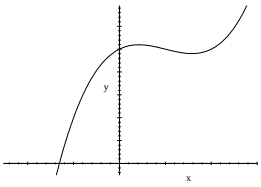
(a) $(f \circ g)(5) = -2$
(b) $(f \circ g)(5) = 5$
(c) $(f \circ g)(5) = -3$
(d) $(f \circ g)(5) = 1$
(e) $(f \circ g)(5) = -1$

22. Find $f \circ g \circ h$, where $f(x) = \sqrt{1 - x}$, $g(x) = 1 - x^2$, $h(x) = 1 + \sqrt{x}$.

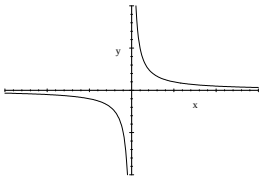
(a) $\sqrt{\left(1 + \sqrt{x}\right)}$
(b) $1 + \sqrt{x}$
(c) $\sqrt{1 + x^2}$
(d) $\sqrt{1 - x}$
(e) $1 + x^2$

23. Determine which functions are one-to-one.

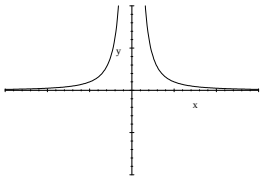
I



II



III



(a) I only
(b) I, II
(c) I, II, III
(d) II only
(e) III only

24. Find the inverse of the function.

$$f(x) = \frac{x-7}{4}$$

(a) $f^{-1}(x) = x + 7$
(b) $f^{-1}(x) = \dfrac{4x}{7}$
(c) $f^{-1}(x) = \dfrac{x+7}{4}$
(d) $f^{-1}(x) = 4x + 7$
(e) none of these

25. Find the inverse of the function.

$$g(x) = x^2 - 16,\ x \geq 0$$

(a) $g^{-1}(x) = -\sqrt{x+16}$
(b) $g^{-1}(x) = \sqrt{x+16}$
(c) $g^{-1}(x) = 4 + \sqrt{x}$
(d) $g^{-1}(x) = 4 - \sqrt{x}$
(e) none of these

ANSWER KEY

Stewart/Redlin/Watson - Precalculus 7e Chapter 2 Form D

1. c
2. d
3. b
4. a
5. c
6. d
7. b
8. e
9. c
10. c
11. e
12. a
13. a
14. b
15. e
16. b
17. d
18. e
19. a
20. b
21. c
22. b
23. d
24. d
25. b

1. If $g(x)=\frac{4}{x}+x^2$, find $g(4)$.

a) 4 b) 6 c) 1 d) 17 e) 21

2. Find the domain of the function.

$f(x)=2x^2-3, \quad 0\le x<5$

a) $[0,6]$
b) $(-\infty,\infty)$
c) $(3/2,\infty)$
d) $(-\infty,5)\cup(5,\infty)$
e) $[0,5)$

3. Find the domain of the function.

$f(x)=\frac{x-1}{x^2-4}$

a) $(-4,4)$
b) $(-\infty,-2)\cup(-2,2)\cup(2,\infty)$
c) $(2,\infty)$
d) $(-\infty,-2)\cup(2,\infty)$
e) none of these

4. Evaluate $f(-1)$, $f(0)$, $f(1)$, for the piecewise-defined function.

$$f(x)=\begin{cases}3x^2 & \text{if } x<0\\ 2x+1 & \text{if } x\ge 0\end{cases}$$

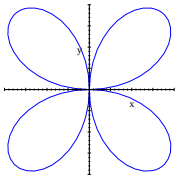
a) $f(-1)=3$, $f(0)=1$, $f(1)=3$
b) $f(-1)=0$, $f(0)=3$, $f(1)=-3$
c) $f(-1)=-1$, $f(0)=0$, $f(1)=1$
d) $f(-1)=3$, $f(0)=1$, $f(1)=-3$
e) none of these

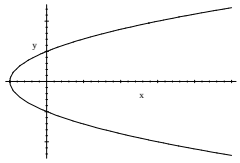
5. Sketch the graph of the piecewise defined function.

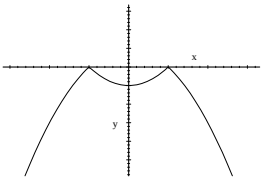
$$f(x)=\begin{cases}x+2 & \text{if } x<0\\ 2 & \text{if } 0\le x\le 1\\ 3-x & \text{if } 1<x\end{cases}$$

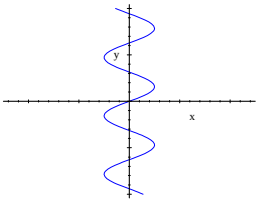
6. Determine if the equation $x^2+y^2-25=0$ defines y as a function of x. Explain your answer.

7. Determine whether each curve represents a graph of a function.

a.) 

b.) 

c.) 

d.) 

8. A function f is given, and the indicated transformations are applied to its graph (in the given order). Write the equation for the final transformed graph.

$f(x) = |x|$; shift to the left $\frac{1}{2}$ unit, shrink vertically by a factor of 0.2, and shift downward 2 units.

9. Sketch the graph of the function $f(x) = 2 + \sqrt{x}$.

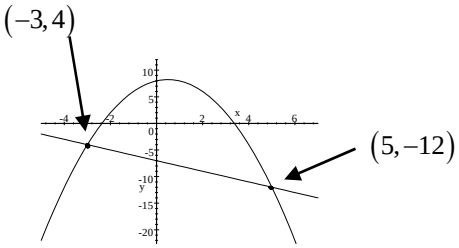
10. Sketch the graph of the function.

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

11. Use a graphing calculator to find, approximately the range of the function.

$f(x) = x^4 - x^3 + x^2 + 2x - 15$

12. For the given graph of a function, determine the average rate of change between the indicated values.



13. For the function $g(t) = \frac{1}{3t-2}$ determine the average rate of change between the values $t = 0$ and $t = a + 1$.

14. Use a graphing calculator to determine approximately the intervals on which the function is increasing, and on which f is decreasing.

$f(x) = x^4 + 6x^3 + x^2 - 24x + 16$

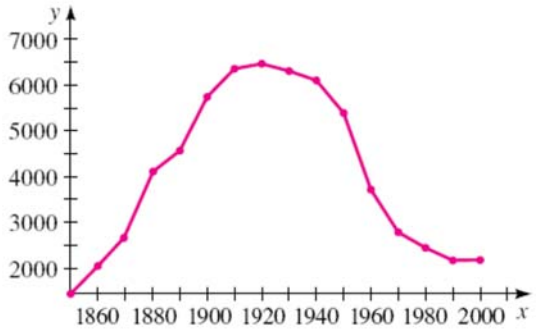
15. Describe how the graph of $y = -f(3x) + 4$ can be obtained from the graph of f.

16. Determine whether $f(x) = x^2 - x^6$ is even, odd, or neither.

a) even b) odd c) neither even nor odd d) both even and odd

17. The graph gives the number of farms in the United States from 1850 to 2000.
Estimate the average rate of change in the number of farms between the following years.

(i) 1860 and 1890
(ii) 1920 and 1980



18. A man is running around a circular track that is 200 m in circumference. An observer uses a stopwatch to record the runner's time at the end of each lap, obtaining the data in the following table.

What was the man's average speed (rate) between 108 s and 203 s? Round the answer to two decimal places.

Time (s)	Distance (m)
32	200
68	400
108	600
152	800
203	1000
263	1200
335	1400
412	1600

19. Use a graphing device to draw the graph of the function $f(x) = -3 - 3x^2$. State approximately the interval(s) on which the function is increasing and on which the function is decreasing.

a) f is increasing on $(-\infty, 0]$ and decreasing on $[0, \infty)$
b) f is increasing on $(-\infty, -3)$ and decreasing on $[3, \infty)$
c) f is increasing on $(-\infty, \infty)$
d) f is and decreasing on $[0, \infty)$ only
e) none of these

20. If $f(x) = 3x - 2$ and $g(x) = 3 + 2x^2$, find fg and $(f \circ g)(x)$.

21. Given $f(x) = 2 + x^2$ and $g(x) = \sqrt{x-1}$, find $(f \circ g)(2)$, $(f \circ f)(2)$.

22. Determine whether the function $f(x) = -2x^2 + 18x - 16$ is one-to-one.

23. Use a graphing calculator or computer to determine whether the function $f(x) = -|x| - |5 - x|$ is one-to-one.

24. Find the inverse of the function.

$$f(x) = \frac{x-2}{3}$$

a) $f^{-1}(x) = 2x - 3$
b) $f^{-1}(x) = 2x$
c) $f^{-1}(x) = \dfrac{x+2}{3}$
d) $f^{-1}(x) = 3x + 2$
e) none of these

25. Find the inverse of the function.

$$g(x) = x^2 - 9,\ x \geq 0$$

ANSWER KEY

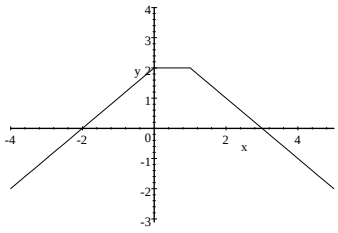
Stewart/Redlin/Watson - Precalculus 7e Chapter 2 Form E

1. d

2. e

3. b

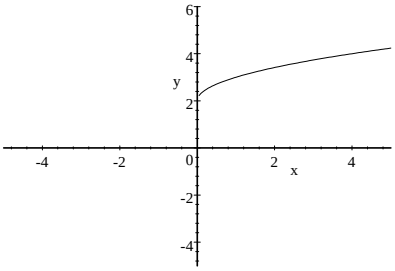
4. a

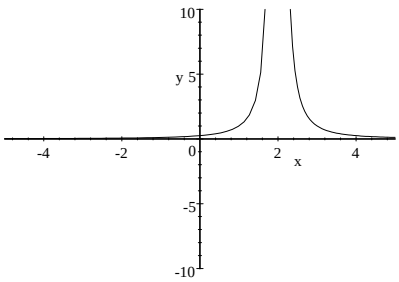
5. 

6. $x^2 + y^2 - 25 = 0 \Leftrightarrow y^2 = 25 - x^2 \Leftrightarrow y = \pm\sqrt{25 - x^2}$. No. This equation gives two values of y for a given value of x.

7. (a) no (b) no (c) yes (d) no

8. $f(x) = 0.2\left|x + \frac{1}{2}\right| - 2$

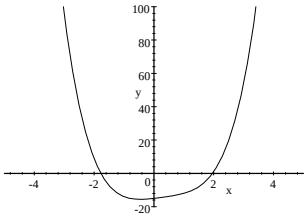
9. 

10. 

ANSWER KEY

Stewart/Redlin/Watson - Precalculus 7e Chapter 2 Form E

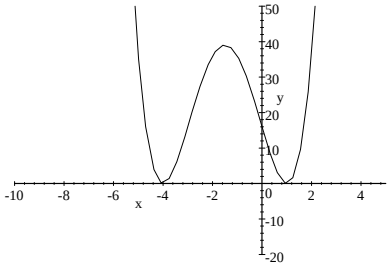
11. Range $[-15,\infty)$



12. The average rate of change for the function between the points $(-3,-4)$ and $(5,-12)$ is $\frac{-12-(-4)}{5-(-3)}=\frac{-8}{8}=-1$.

13. Average rate of change $=\frac{g(a+1)-g(0)}{a+1-0}=\frac{\frac{1}{3a+1}+\frac{1}{2}}{a+1}=\frac{\frac{3}{2}\frac{a+1}{3a+1}}{a+1}=\frac{3}{2(3a+1)}$

14. The function is increasing on $[-4,-1.5]$, $[1,\infty)$. Decreasing on $(-\infty,-4]$, $[-1.5,1)$



15. By shrinking horizontally by a factor of $\frac{1}{3}$, then reflecting about the x - axis, then shifting 4 units up. Determine whether the function in the figure is even, odd, or neither.

16. a

17. (i) ≈ 83 farms/yr (ii) ≈ -67 farms/yr

18. 4.21 m/s

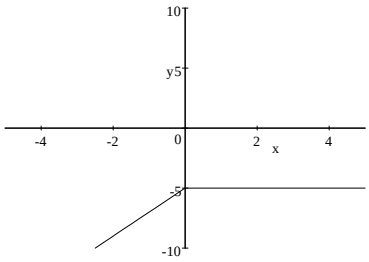
19. a

20. $fg=6x^3-4x^2+9x-6$
$(f\circ g)(x)=7+6x^2$

21. $(f\circ g)(2)=3$
$(f\circ f)(2)=38$

22. $f(x) = -2x^2 + 18x - 16 = -2(x-8)(x-1)$, so $f(8) = 0 = f(1)$, so f is not one-to-one.

23. Using a graphing calculator and the horizontal line test we see that $f(x) = -|x| - |5-x|$ is not one-to-one.



24. d

25. $g^{-1}(x) = \sqrt{x+9}$

1. If $f(x) = x^3 + 2x - 1$, find $f(a)$.

(a) $a^3 + 2a - 1$ (b) $2a^3 + a - 16$ (c) $2a^3 + 3a$ (d) $4a^3$ (e) $2a^3 - a + 1$

2. Find the range of the function.

$f(x) = 2x^2 - 3$

(a) $[0, \infty)$ (b) $(-\infty, \infty)$ (c) $(-3/2, \infty)$ (d) $(-\infty, -3) \cup (3, \infty)$ (e) $[-3, \infty)$

3. Find the domain of the function.

$$f(x) = 3x - \frac{2}{\sqrt{x+1}}$$

(a) $(-1,1)$ (b) $(-\infty, -1) \cup (1, \infty)$ (c) $(-1, \infty)$ (d) $(-\infty, -1] \cup [1, \infty)$ (e) none of these

4. Evaluate $f(-1)$, $f(0)$, $f(1)$, for the piecewise-defined function.

$$f(x) = \begin{cases} 1 - 2x & \text{if } x \le 0 \\ 2x - 1 & \text{if } x > 0 \end{cases}$$

(a) $f(-1) = 3$, $f(0) = -1$, $f(1) = 2$
(b) $f(-1) = 0$, $f(0) = 3$, $f(1) = -3$
(c) $f(-1) = -1$, $f(0) = 0$, $f(1) = 1$
(d) $f(-1) = -1$, $f(0) = 1$, $f(1) = 1$
(e) none of these

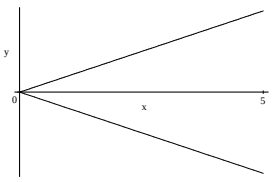
5. Sketch the graph of the function.

$G(x) = x^3 - 3x^2$

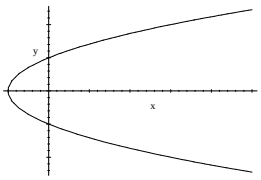
6. Determine if the equation $x^2 + (y-1)^2 - 4 = 0$ defines y as a function of x. Explain your answer.

7. Determine whether each curve represents a graph of a function.

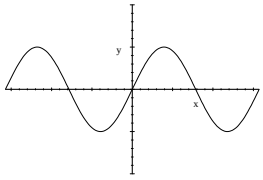
a.)



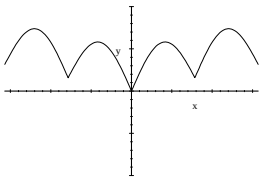
b.)



c.)



d.)



8. Suppose the graph of f is given. Describe how the graph of the function $y = f(x-3)-3$ can be obtained from the graph of f.

9. Sketch the graph of the function $f(x) = 2+\sqrt{x}$.

10. A function f is given, and the indicated transformations are applied to its graph (in the given order). Find the equation for the final transformed graph.

$f(x) = \sqrt{x}$; shift 5 units to the left, stretch vertically by a factor of 2, and reflect in the x-axis.

(a) $f(x) = -2\sqrt{x}+5$

(b) $f(x) = -\frac{1}{2}\sqrt{x}-5$

(c) $f(x) = -5\sqrt{x-2}$

(d) $f(x) = -\sqrt{5x-2}$

(e) $f(x) = -2\sqrt{x+5}$

11. Use a graphing calculator to find, approximately the range of the function.

$f(x) = 2x^4 - x^3 + x^2 + 2x - 7$

(a) $[-2, 7)$

(b) $(-\infty, \infty)$

(c) $[-14, \infty)$

(d) $[-7, \infty)$

(e) $[-\infty, 7)$

12. Find the average rate of change of the function between the given points

$f(x) = 2x^2 + x$; $x = 0,\ x = 2$

13. For the function $g(t) = \frac{1}{3t-2}$ determine the average rate of change between the values $t = 0$ and $t = c+1$.

14. Use a graphing calculator to determine approximately the intervals on which the function is increasing, and on which f is decreasing.

$f(x) = x^4 + 6x^3 + x^2 - 24x + 16$

15. Describe how the graph of $y = -f(2x)-4$ can be obtained from the graph of f.

(a) Shrink horizontally by a factor of $1/2$, then reflecting about the x - axis, then shifting 4 units down.

(b) Shrink horizontally by a factor of 4, then reflecting about the x - axis, then shifting 2 units up.

(c) Shrink horizontally by a factor of $1/2$, then reflecting about the y - axis, then shifting 4 units right.

(d) Shrink horizontally by a factor of $1/2$, then reflecting about the x - axis, then shifting 2 units down.

(e) Shrink horizontally by a factor of $1/2$, then reflecting about the y - axis, then shifting 4 units up.

16. Determine whether $f(x) = x^2 - x^4$ is even, odd, or neither.

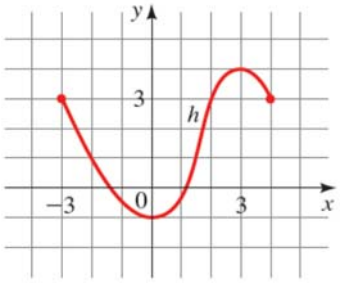
(a) even
(b) odd
(c) neither even nor odd
(d) both even and odd
(e) not enough information to determine

17. A function is given. **(a)** Find all the local maximum and minimum values of the function and the value of *x* at which each occurs. **(b)** Find the intervals on which the function is increasing and on which the function is decreasing. State all answers correct to two decimal places.

$$G(x) = \frac{2}{x^2 + x + 1}$$

18. The graph of a function *h* is given.

(a) Find $h(-3), h(-2), h(0),$ and $h(3)$
(b) Find the domain and range of *h*.
(c) Find the values of *x* for which $h(x) = 3$
(d) Find the values of *x* for which $h(x) \le 3$.



19. Use a graphing device to draw the graph of the function $f(x) = -3 - 3x^2$. State approximately the interval(s) on which the function is increasing and on which the function is decreasing.

(a) f is increasing on $(-\infty, 0]$ and decreasing on $[0, \infty)$
(b) f is increasing on $(-\infty, -3)$ and decreasing on $[3, \infty)$
(c) f is increasing on $(-\infty, \infty)$
(d) f is decreasing on $[0, \infty)$ only
(e) none of these

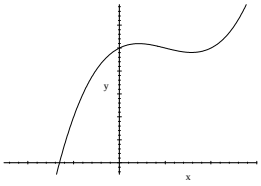
20. If $f(x) = 3x - 2$ and $g(x) = 3 + 2x^2$, find fg and $(g \circ f)(x)$.

(a) $fg = x^3 - 4x^2 + 9x - 1$; $(g \circ f)(x) = 18x^2 - 24x + 11$
(b) $fg = 6x^3 - 4x^2 + 9x - 6$; $(g \circ f)(x) = 18x^2 - 24x + 11$
(c) $fg = 2x^2 + 3x + 1$; $(g \circ f)(x) = 6x^2 + 7$
(d) $fg = 6x^2 + 7$; $(g \circ f)(x) = 6x^3 - 4x^2 + 9x - 6$
(e) none of these

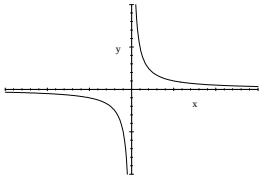
21. Given $f(x) = 2 + x^2$ and $g(x) = \sqrt{x-1}$, find $(f \circ g)(2)$, $(f \circ f)(2)$.

22. Determine which functions are one-to-one.

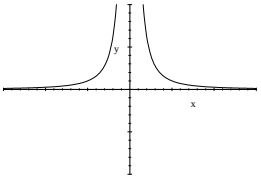
I



II



III



(a) I only (b) I, II (c) I, II, III (d) II only (e) III only

23. Use a graphing calculator or computer to determine whether the function $f(x) = -|x| - |5 - x|$ is one-to-one.

24. Find the inverse of the function.

$f(x) = 3x + 2$

(a) $f^{-1}(x) = x - 2$

(b) $f^{-1}(x) = 2x$

(c) $f^{-1}(x) = \dfrac{x+2}{3}$

(d) $f^{-1}(x) = \dfrac{x-2}{3}$

(e) none of these

25. Find the inverse of the function.

$g(x) = x^2 - 16,\ x \geq 0$

ANSWER KEY

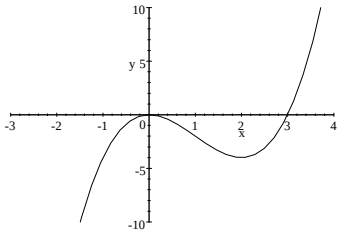
Stewart/Redlin/Watson - Precalculus 7e Chapter 2 Form F

1. a

2. e

3. c

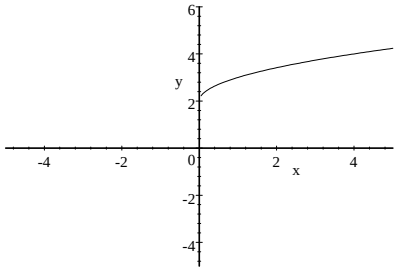
4. e

5. 

6. $x^2+(y-1)^2-4=0 \Leftrightarrow y=1\pm\sqrt{4-x^2}$. No. This equation gives two values of y for a given value of x.

7. (a) no, (b) no, (c) yes, (d) yes

8. Shift the graph of f 3 units to the right then 3 units down

9. 

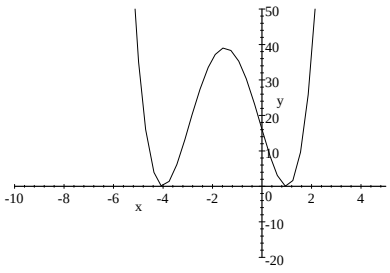
10. e

11. d

12. 5

13. Average rate of change: $\dfrac{3}{2(3c+1)}$

14. The function is increasing on $[-4,-1.5]$, $[1,\infty)$. Decreasing on $(-\infty,-4]$, $[-1.5,1)$



ANSWER KEY

Stewart/Redlin/Watson - Precalculus 7e Chapter 2 Form F

15. a

16. a

17. (a) local maximum ≈ 2.67 when $x \approx -0.50$; no local minimum (b) increasing on $(-\infty, -0.50]$; decreasing on $[-0.50, \infty)$

18. (a) $h(-3) = 3; h(-2) = 1; h(0) = -1; h(3) = 4$; (b) Domain $[-3, 4]$, Range $[-1, 4]$;(c) $-3, 2, 4$;(d) $-3 \le x \le 2$

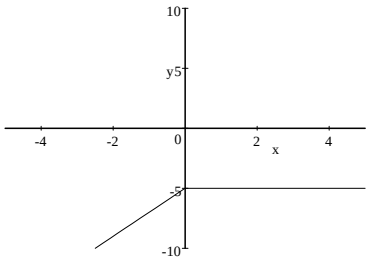
19. a

20. b

21. $(f \circ g)(2) = 3$
$(f \circ f)(2) = 38$

22. d

23. Using a graphing calculator and the horizontal line test we see that $f(x) = -|x| - |5 - x|$ is not one- to-one.



24. d

25. $g^{-1}(x) = \sqrt{x+16}$