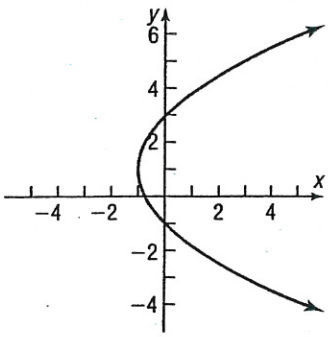
Chapter Test

1. Determine whether each relation represents a function. For each function, state the domain and range.

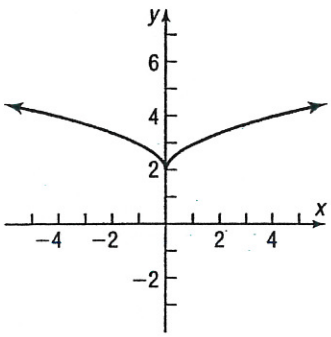
(a) $\{(2,5),(4,6),(6,7),(8,8)\}$

(b) $\{(1,3),(4,-2),(-3,5),(1,7)\}$

(c)



(d)



In Problems 2–4, find the domain of each function and evaluate each function at $x = -1$.

2. $f(x) = \sqrt{4 - 5x}$

3. $g(x) = \dfrac{x+2}{|x+2|}$

4. $h(x) = \dfrac{x-4}{x^2 + 5x - 36}$

5. Using the graph of the function f below:

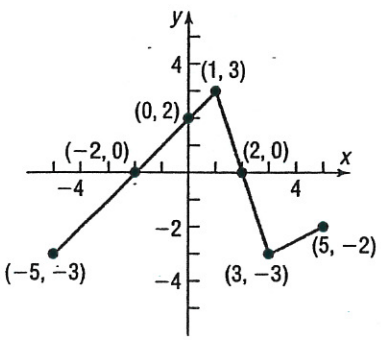
(a) Find the domain and the range of f.

(b) List the intercepts.

(c) Find $f(1)$.

(d) For what value(s) of x does $f(x) = -3$?

(e) Solve $f(x) < 0$



6. Use a graphing utility to graph the function $f(x) = -x^4 + 2x^3 + 4x^2 - 2$ on the interval $(-5, 5)$. Approximate any local maxima and local minima rounded to two decimal places. Determine where the function is increasing and where it is decreasing.

7. Consider the function $g(x) = \begin{cases} 2x + 1 & x < -1 \\ x - 4 & x \geq -1 \end{cases}$

(a) Graph the function.

(b) List the intercepts.

(c) Find $g(-5)$.

(d) Find $g(2)$.

8. For the function $f(x) = 3x^2 - 2x + 4$, find the average rate of change from 3 to x.

9. For the functions $f(x) = 2x^2 + 1$ and $g(x) = 3x - 2$, find the following and simplify:

(a) $f - g$

(b) $f \cdot g$

(c) $f(x + h) - f(x)$

10. Graph each function using the techniques of shifting, compressing or stretching, and reflections. Start with the graph of the basic function and show all stages.

(a) $h(x) = -2(x + 1)^3 + 3$

(b) $g(x) = |x + 4| + 2$

11. Consider the two data sets:

Set A:

x	0	1	2	3	4	5	6	7
y	−5	−9	−8	−6	−9	−6	−3	4

Set B:

x	0	1	2	3	4	5	6	7
y	−4	−5	−1	0	4	4	7	9

(a) Use a graphing utility to make a scatter diagram for each set of data, and determine which of the two data sets has a stronger linear relationship.

(b) Use a graphing utility to find the line of best fit for the data set you selected in part (a).

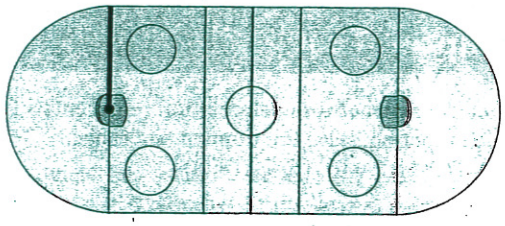
12. The variable interest rate on a student loan changes each July 1 based on the bank prime loan rate. For the years 1992–2004, this rate can be approximated by the model $r(x) = -0.115x^2 + 1.183x + 5.623$, where x is the number of years since 1992 and r is the interest rate as a percent.

(SOURCE: U.S. Federal Reserve)

(a) Use a graphing utility to estimate the highest rate during this time period. During which year was the interest rate the highest?

(b) Use the model to estimate the rate in 2010. Does this value seem reasonable?

13. A community skating rink is in the shape of a rectangle with semicircles attached at the ends. The length of the rectangle is 20 feet less than twice the width. The thickness of the ice is 0.75 inch.
(a) Write the ice volume, V, as a function of the width, x.
(b) How much ice is in the rink if the width is 90 feet?



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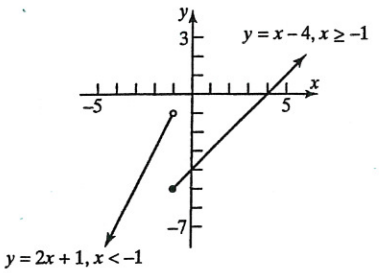
1. **(a)** Function; domain: {2, 4, 6, 8}; range: {5, 6, 7, 8} **(b)** Not a function **(c)** Not a function **(d)** Function; domain: all real numbers; range: $\{y|y \geq 2\}$ **2.** Domain: $\left\{x|x \leq \frac{4}{5}\right\}$; $f(-1) = 3$ **3.** Domain: $\{x|x \neq -2\}$; $g(-1) = 1$ **4.** Domain: $\{x|x \neq -9, x \neq 4\}$; $h(-1) = \frac{1}{8}$ **5.** **(a)** Domain: $\{x|-5 \leq x \leq 5\}$; range: $\{y|-3 \leq y \leq 3\}$ **(b)** (0, 2), (−2, 0), and (2, 0) **(c)** $f(1) = 3$ **(d)** $x = -5$ and $x = 3$ **(e)** $\{x|-5 \leq x < -2 \text{ or } 2 < x \leq 5\}$; $[-5, -2) \cup (2, 5]$

6. Local maxima: $f(-0.85) \approx -0.86$
$f(2.35) \approx 15.55$
Local minima: $f(0) = -2$
The function is increasing on the intervals $(-5, -0.85)$ and $(0, 2.35)$ and decreasing on the intervals $(-0.85, 0)$ and $(2.35, 5)$.

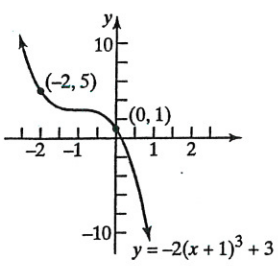
7. **(a)**



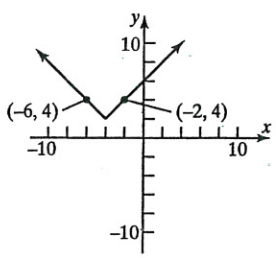
(b) (0, −4), (4, 0) **(c)** $g(-5) = -9$ **(d)** $g(2) = -2$

8. $\frac{f(x) - f(3)}{x - 3} = 3x + 7, x \neq 3$ **9.** **(a)** $(f - g) = 2x^2 - 3x + 3$ **(b)** $(f \cdot g) = 6x^3 - 4x^2 + 3x - 2$ **(c)** $f(x + h) - f(x) = 4xh + 2h^2$

10. **(a)**



(b)



11. **(a)** Set B is more linear. **(b)** $y = 2.02x - 5.33$

12. **(a)** 8.67% occurring in 1997 ($x \approx 5$) **(b)** The model predicts that the interest rate will be −10.343%. This is not reasonable.

13. **(a)** $V(x) = \frac{x^2}{8} - \frac{5x}{4} + \frac{\pi x^2}{64}$ **(b)** 1297.61 ft³