Chapter 3 Test - PreCalculus - Mr. Lee   **Study Guide**

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.
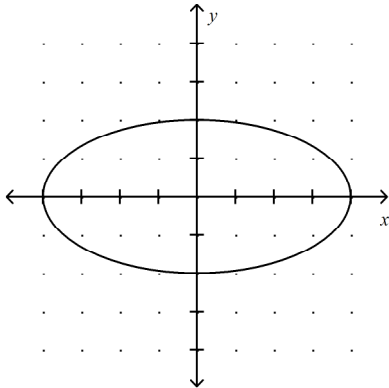
_____   1. Determine the domain of the function.
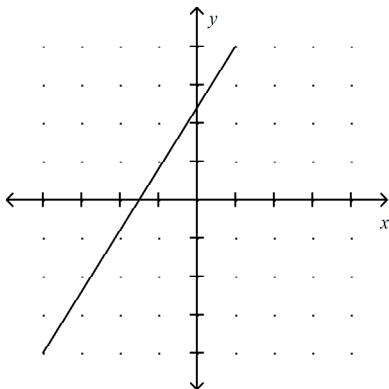
$$h(x) = \frac{5x}{x(x^2 - 49)}$$

     a. All real numbers except $\pm\,7$.   c. All real numbers except 7.
     b. All real numbers except $\pm\,7$ and 0.   d. All real numbers except $\pm\,49$.

_____   2. Use the Vertical Line Test to determine which graph defines a function.
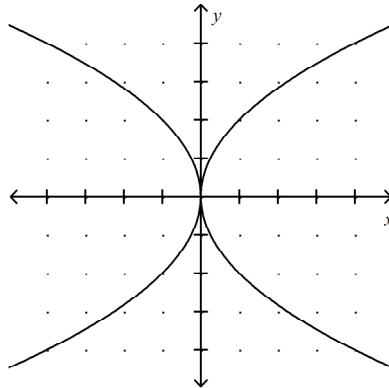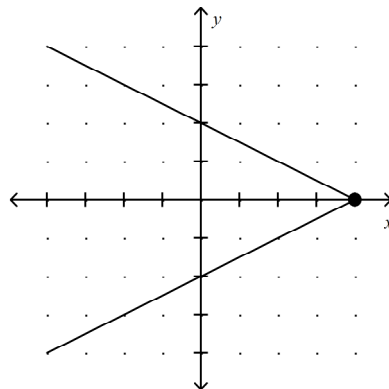
     a.

     c.

     b.

     d.

_____   3. Find the approximate intervals on which the graph of $f(x) = \dfrac{21}{4x^2 + 12}$ is concave up and those on which it is

concave down, and estimate all inflection points.
     a. concave downward (–5, 1); concave upward $(-\infty, -5)$ and $(1, -\infty)$; points of inflection
         at –5 and 1
     b. concave downward (–1, 1); concave upward $(-\infty, -1)$ and $(1, \infty)$; points of inflection at
         −1 and 1
     c. concave downward (–4, 2); concave upward $(-\infty, -4)$ and $(2, -\infty)$; points of inflection
   at –4 and 2
     d. None of these

____ 4. Find all local maxima and minima and points of inflection of the function.

$f(x) = -2x^3 + 6x^2 + 18x - 18$

    a. $x = -1$ is a local minimum, $x = 3$ is a local maximum, $x = 1$ is a point of inflection.

    b. $x = 1$ is a local minimum, $x = -3$ is a local maximum, $x = -1$ is a point of inflection.

    c. $x = 1$ and $x = -3$ are local maxima, $x = 1$ is a point of inflection.

    d.   None of these

____ 5. Determine the x-intercepts of the quadratic function $f(x) = (x - 5)(x - 4)$ and determine if its graph opens up or down.

    a. x-intercepts: 5, 4; opens up   c. x-intercepts: 12, 5; opens up

    b. x-intercept: 12; opens up   d. x-intercepts: 2, 5; opens up

____ 6. Determine the x-intercepts and the vertex of the graph of the quadratic function

$f(x) = x^2 + 11x + 30.$

    a.   The x-intercepts are –5 and –6. Vertex is (–5.5, –0.25).

    b.   The x-intercepts are 5 and –6. Vertex is (0, –0.25).

    c.   The x-intercepts are 6 and –6. Vertex is (–5.5, 0).

    d.   The x-intercepts are 6 and –5. Vertex is (–5.5, –0.5).

____ 7. Given $f(x) = x^3$ and $g(x) = 1 - 5x^2$, find $(f \circ g)(x)$ and its domain.

    a. $(1 - 5x^3)$, $x \neq \sqrt[3]{-3}$

    b. $(1 - 5x^2)^3$, all real numbers

    c. $(1 - 5x^3)$, $x \neq \sqrt[3]{-\dfrac{3}{5}}$

    d.   None of these

____ 8. For the function $f(x) = -7x^2 + 9x - 6$, find

a. the difference quotient.

b. the average rate of change over the interval 3 to 4.

    a.   a. $-14x - 7h + 9$ c.   a. $-14x - 7h + 9$

           b. –40   b. –44

    b.   a. $-14hx - 7h + 9h$ d.   a. $-14hx - 7h + 9h$

           b. –40   b. –44

_____ 9. Graph the piecewise function $h(x) = \begin{cases} -7 \text{ if } x < 4 \\ 7 \text{ if } x \geq 4 \end{cases}$.
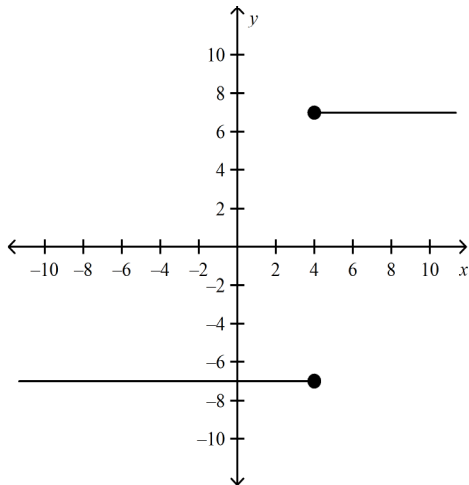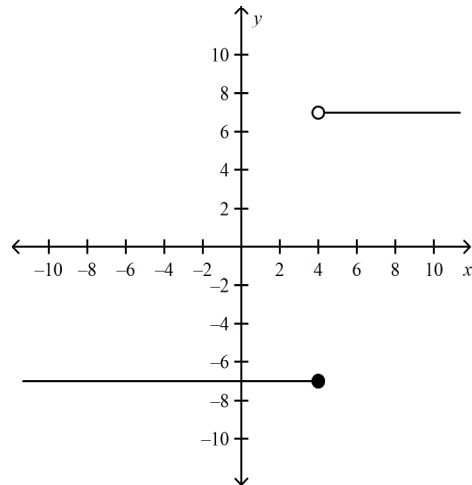
a.
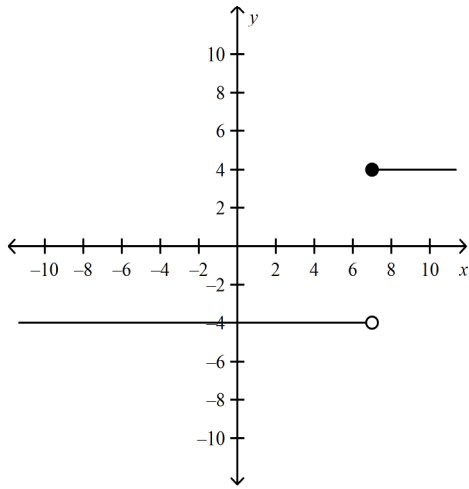
c.
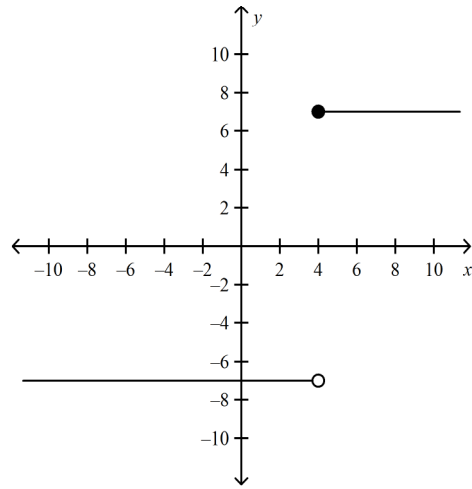
b.

d.

_____ 10. Given $f(x) = x^3$ and $g(x) = 4x + 3$, find $g(f(3))$.
   a. $g(f(3)) = 108$
   b. $g(f(3)) = 405$
   c. $g(f(3)) = 3{,}375$
   d. $g(f(3)) = 111$

Numeric Response

11. Let $f(x) = \begin{cases} 5x^3 - 2 \text{ if } x < -6 \\ 3x^2 - 2 \text{ if } -6 \leq x < 7 \\ 7 + 2x \text{ if } x \geq 7 \end{cases}$. Find $f(-6)$.

12. When a ball is thrown down a hill, the height y of the ball is given by the function $y = -0.25x^2 + 3x$, where x is the horizontal distance from the thrower. The hill is represented by the linear function $y = -\frac{1}{4}x$. Find the maximum height of the ball above the ground. Round to the nearest thousandth.
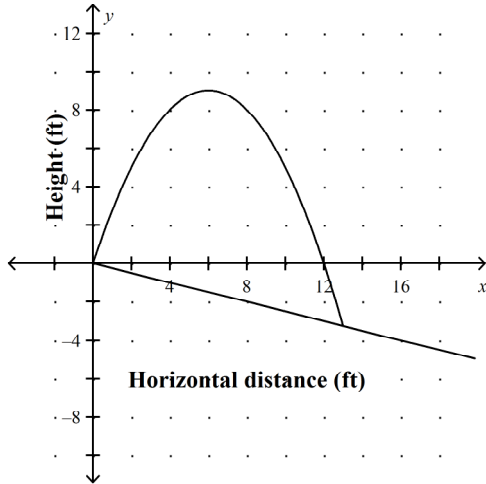
Short Answer

13. Determine the domain of the function.
    $y = \sqrt{x+4} + 2$

14. Find the indicated values of the function.
    $$f(x) = \begin{cases} \dfrac{2}{5}x & \text{if } x > 3 \\ 1 + 6x & \text{if } x \le 3 \end{cases}$$
    a. $f(3)$ b. $f(0)$
    c. $f(5)$ d. $f(2.7)$

15. Determine the vertex and y-intercept of the function and sketch a graph.
    $f(x) = 3(x - 2)^2 + 2$

16. Let $f(x) = 9 - x^2$, $g(x) = 3 - x$. Find $(f - g)(x)$ and its domain.

17. A motorcycle is moving in a straight line on a road. The distance traveled by the bike at various times is shown in the table below. Find the average speed of the bike over each interval.
    a. 0 to 5 seconds
    b. 5 to 10 seconds
    c. 10 to 15 seconds
    d. 0 to 10 seconds
    e. 5 to 15 seconds

Time (seconds)	0	5	10	15
Distance (feet)	0	40	110	270

18. The graph shows the weekly amount of sales (in thousands of dollars) made by a company over a period of ten weeks. Estimate the average rate of change of sales (in dollars per week) over the given intervals.
1 to 4
2 to 6
5 to 9