SM 3H 2023-2024

2.2 The Graph of a Function

SCORE: /

Name _____ **Date** _____ **Period** _____

1. A set of points in the xy-plane is the graph of a function if and only if every _____ line intersects the graph in at most one point.

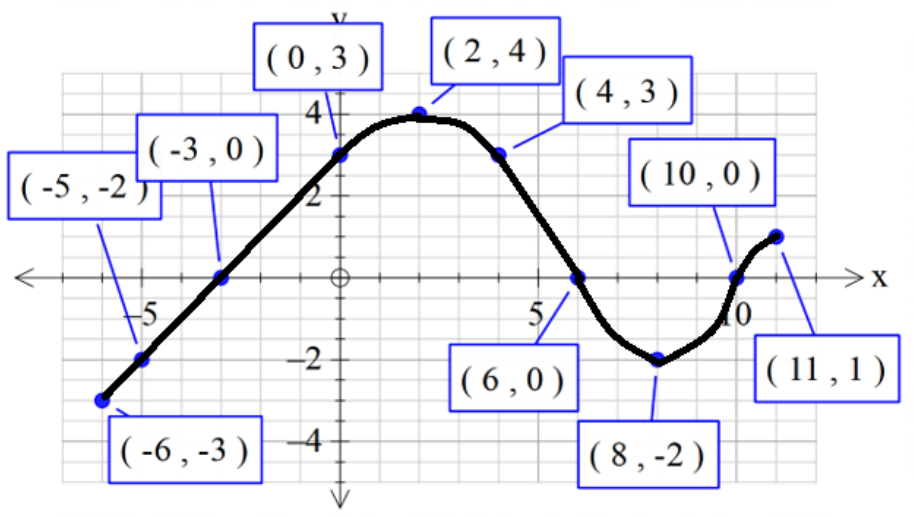
2. If the point (-1, 3) is a point on the graph of f, then f (_____) = _____.

3. Find a so that the point (-2, 5) is on the graph of $f(x) = ax^2 + 4$.

4. **True or False** A function can have more than one y-intercept.

5. **True or False** The graph of a function $y = f(x)$ always crosses the y-axis.

6. Use the graph of the given function f to answer parts (a)-(n).



(a) Find $f(0)$ and $f(-6)$.

(b) Find $f(6)$ and $f(11)$.

(c) Is $f(3)$ positive or negative?

(d) Is $f(-4)$ positive or negative?

(e) For what values of x is $f(x) = 0$?

(f) For what values of x is $f(x) > 0$?

(g) What is the domain of f?

(h) What is the range of f?

(i) What are the x-intercepts?

(j) What is the y-intercept?

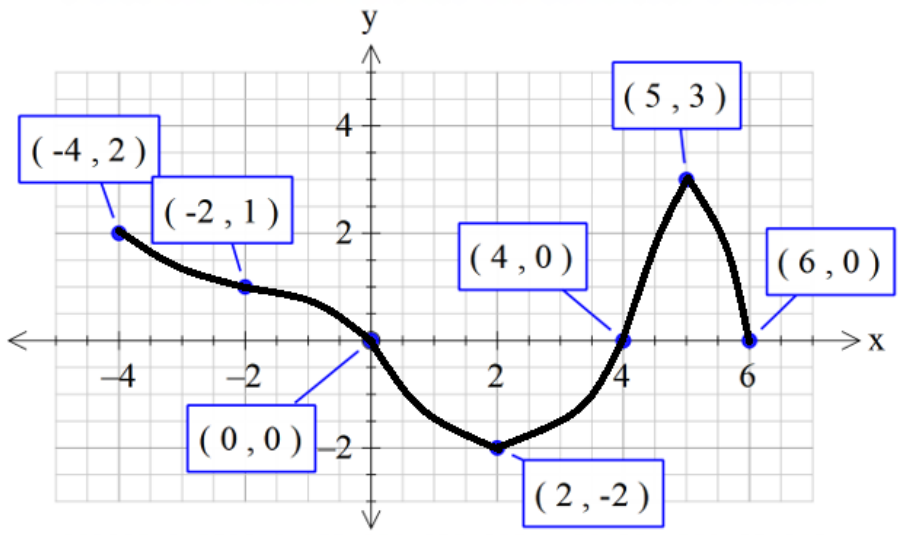
(k) How often does the line $y = \frac{1}{2}$ intersect the graph?

(l) How often does the line $x = 5$ intersect the graph?

(m) For what values of x does $f(x) = 3$?

(n) For what values of x does $f(x) = -2$?

7. Use the graph of the given function f to answer parts (a)-(n).



(a) Find $f(0)$ and $f(6)$.

(b) Find $f(2)$ and $f(-2\ \ )$.

(c) Is $f(3)$ positive or negative?

(d) Is $f(-1)$ positive or negative?

(e) For what values of x is $f(x) = 0$?

(f) For what values of x is $f(x) < 0$?

(g) What is the domain of f ?

(h) What is the range of f ?

(i) What are the x-intercepts?

(j) What is the y-intercept?

(k) How often does the line $y = -1$ intersect the graph?

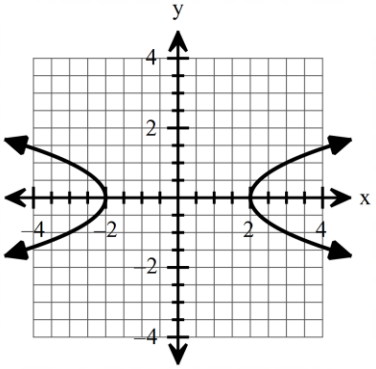
(l) How often does the line $x = 1$ intersect the graph?

(m) For what values of x does $f(x) = 3$?

(n) For what values of x does $f(x) = -2$?

In problems 8-14 determine whether the graph is that of a function by using the vertical-line test. If it is, use the graph to find: a) the domain and range, b) the intercepts, if any, c) Any symmetry with respect to the x-axis, the y-axis or the origin.

8.



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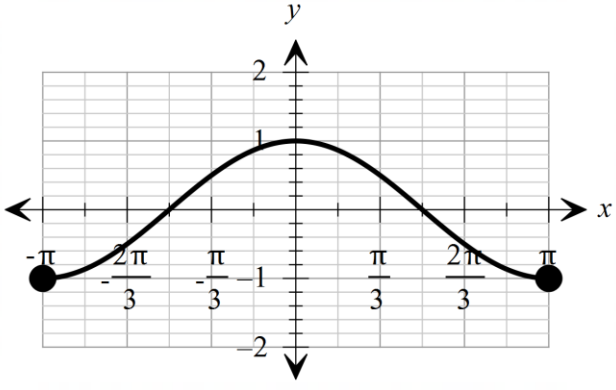
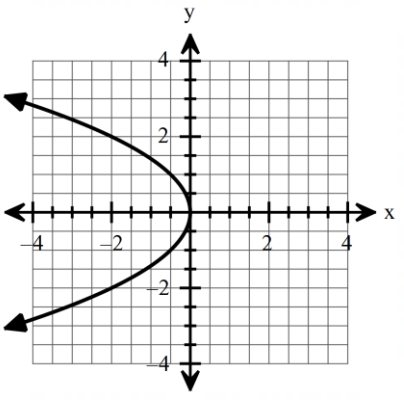
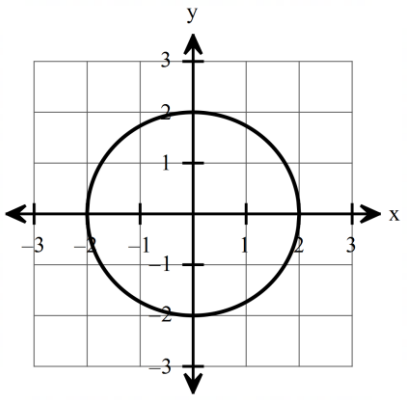
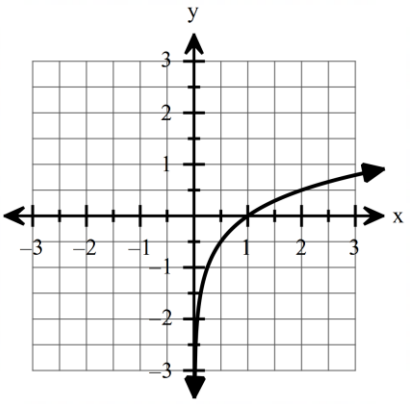
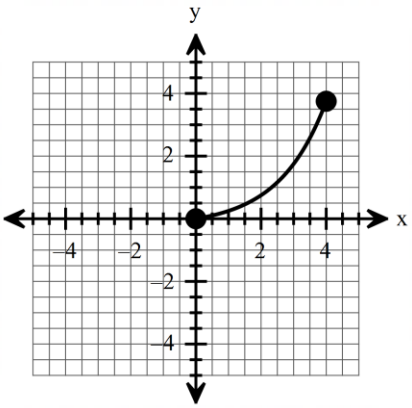
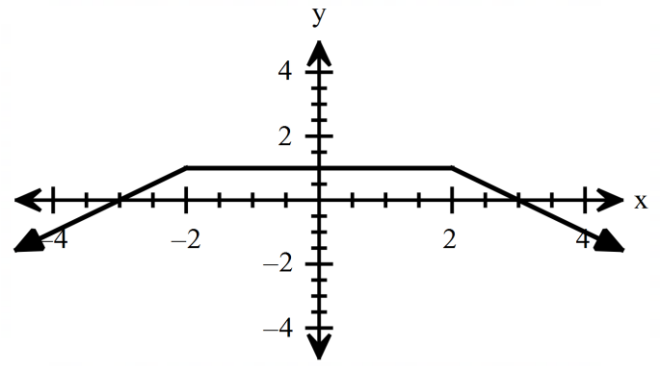


10. 

11. 

12. 

13. 

14. 

In the problems below, answer the questions about the given function.

15. $f(x) = 2x^2 - x - 1$

a) Is the point (-1, 2) on the graph of f?

b) If x = -2, what is $f(x)$? What point is on the graph of f?

c) If $f(x)$ = -1, what is x? What point(s) are on the graph of f?

16. $f(x)=\dfrac{x+2}{x-6}$

a) Is the point (3, 14) on the graph of f?

b) If $x = 4$, what is $f(x)$? What point is on the graph of f?

c) If $f(x) = 2$, what is x? What point(s) are on the graph of f?

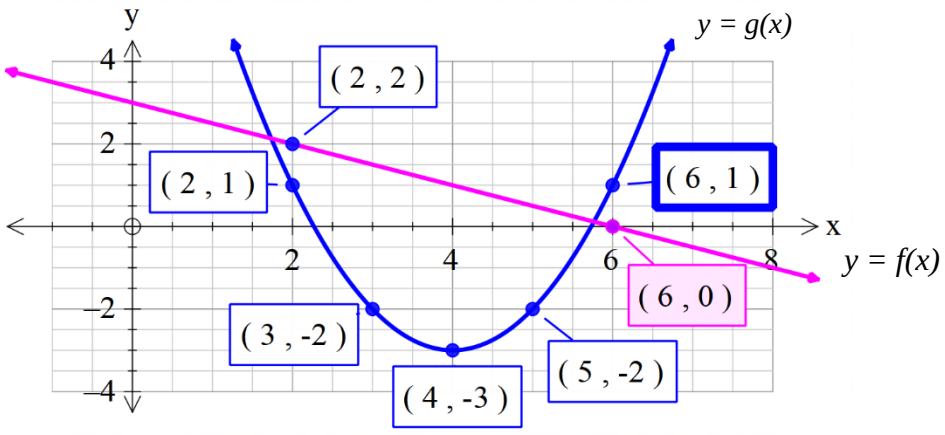
d) What is the domain of f?

e) List the x-intercepts, if any, of the graph of f.

f) List the y-intercept, if there is one, of the graph of f.

The graph of two functions f and g, is illustrated below. Use the graph to answer parts (a)-(f).

17.



(a) $(f+g)(2)$

(b) $(f+g)(4)$

(c) $(f-g)(6)$

(d) $(g-f)(6)$

(e) $(f\cdot g)(2)$

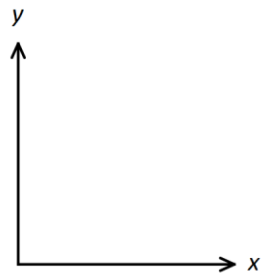
(f) $\left(\dfrac{f}{g}\right)(4)$

18. **A golf ball is hit with an initial velocity of 135 feet per second at an inclination of 45° to the horizontal. In physics, it is established that the height h of the golf ball is given by the function $h(x) = \frac{-32x^2}{135^2} + x$ where x is the horizontal distance that the golf ball has traveled.**

a) Determine the height of the golf ball after it has traveled 150 feet, 350 feet, and 550 feet. Round to the nearest tenth.

b) How far was the golf ball hit? Round to the nearest tenth.

c) Using a graphing calculator, graph the function $h = h(x)$. Sketch the graph. Be sure to label the axes.



Window:

Xmin: -500 Xmax: 700

Xscl: 70

Ymin: -100 Ymax: 200

Yscl: 20

d) How far has the ball traveled when it reaches its maximum height? Round to the nearest tenth.
What is its maximum height? Round to the nearest tenth.

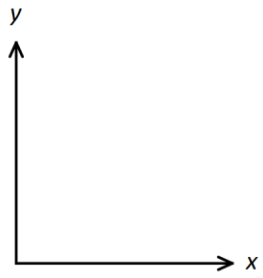
19. The velocity of water flow, in feet per second, from a fire hose nozzle is given by $v(p) = 12.1\sqrt{p}$, where p is the nozzle pressure, in pounds per square inch (psi). Find the nozzle pressure if the water flow velocity is 110 feet per second (find $v(p) = 110$). (Source: Houston Fire Department Continuing Education) **Round answer to nearest thousandths.**

20. **If a rock falls from a height of 20 meters on Earth, the height H (in meters) after x seconds is approximately $H(x) = 20 - 4.9x^2$.**

a) Determine the height of the rock when it is at 1 second, 1.2 seconds, and 2 seconds. Round answers to the nearest tenth.

b) Determine the time of the rock after it has traveled 15 meters, 10 meters, and 5 meters. Round answers to the nearest hundredth.

c) Using a graphing calculator, graph the function $h = h(x)$. Sketch the graph. Be sure to label the axes.



Window:

Xmin: -5 Xmax: 5

Xscl: 1

Ymin: -10 Ymax: 20

Yscl: 2

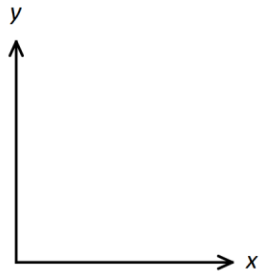
d) When does the rock hit the ground? Round answer to the nearest hundredth.

21. If a player shoots a foul shot, releasing the ball at a 45° angle from a position 6 feet above the floor, then the path of the ball can be modeled by the function $h(x) = -\frac{44x^2}{v^2} + x + 6$ where h is the height of the ball above the floor, x is the forward distance of the ball in front of the foul line, and v is the initial velocity with which the ball is shot in feet per second. Suppose a player shoots a ball with an initial velocity of 28 feet per second.

a) Determine the height of the ball after is has traveled 8 feet in front of the foul line. Round answer to the nearest tenth.

b) Determine the height of the ball after it has traveled 12 feet in front of the foul line. Round answer to the nearest tenth.

c) Using a graphing calculator, graph the function $h = h(x)$. Sketch the graph. Be sure to label the axes.



Window:

Xmin: -10 Xmax: 30

Xscl: 3

Ymin: -10 Ymax: 20

Yscl: 2

d) The center of the hoop is 10 feet above the floor and 15 feet in front of the foul line. Will the ball go through the hoop? Why or why not? If not, with what initial velocity must the ball be shot in order for the ball to go through the hoop?