1. What is the domain of $f(x) = \frac{1}{x}$? What is its range?

The domain of $f(x) = \frac{1}{x}$ is _____.
(Type your answer in interval notation.)

The range of $f(x) = \frac{1}{x}$ is _____.
(Type your answer in interval notation.)

2. What is the largest open interval over which $f(x) = \frac{1}{x}$ increases, decreases, and is constant?

What is the largest open interval over which $f(x) = \frac{1}{x}$ increases? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The open interval is _____.
  (Type your answer in interval notation. Use a comma to separate answers as needed.)
- **B.** None

What is the largest open interval over which $f(x) = \frac{1}{x}$ decreases? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The open interval(s) is/are _____.
  (Type your answer in interval notation. Use a comma to separate answers as needed.)
- **B.** None

What is the largest open interval over which $f(x) = \frac{1}{x}$ is constant? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The open interval is _____.
  (Type your answer in interval notation. Use a comma to separate answers as needed.)
- **B.** None

3. What are the equations of the vertical and the horizontal asymptotes of the graph of $y = \frac{1}{x-3} + 5$?

The vertical asymptote is _____. (Type an equation.)

The horizontal asymptote is _____. (Type an equation.)

4. Is $f(x) = \frac{1}{x^2}$ an even or an odd function? What symmetry does its graph exhibit?

Is $f(x) = \frac{1}{x^2}$ an even or an odd function?

- ○ even
- ○ odd

What symmetry does its graph exhibit? Select all that apply.

- ☐ The graph of a function is symmetric with respect to the y-axis.
- ☐ The graph of a function is symmetric with respect to the x-axis.
- ☐ The graph of a function is symmetric with respect to the origin.

5. Is $f(x) = \frac{1}{x}$ an even or an odd function? What symmetry does its graph exhibit?

Is $f(x) = \frac{1}{x}$ an even or an odd function?

- ○ **A.** even
- ○ **B.** odd

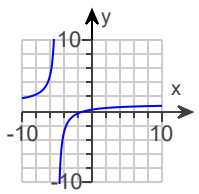
What symmetry does its graph exhibit? Select all that apply.

- ☐ The graph of a function is symmetric with respect to the origin.
- ☐ The graph of a function is symmetric with respect to the y-axis.
- ☐ The graph of a function is symmetric with respect to the x-axis.

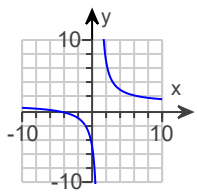
6. Identify the graph with domain $(-\infty, -1) \cup (-1, \infty)$.

Choose the graph with the correct domain from the choices on the right.

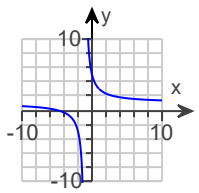
○ **A.**



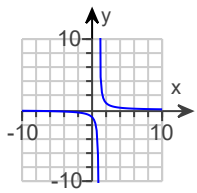
○ **B.**



○ **C.**



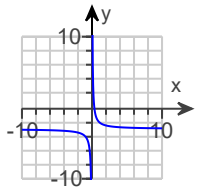
○ **D.**



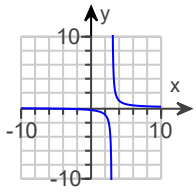
7. Identify the graph with range$(-\infty,3) \cup (3,\infty)$.

Choose the correct graph on the right.

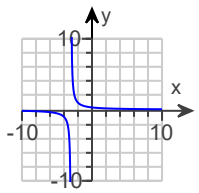
A.



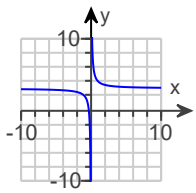
B.



C.



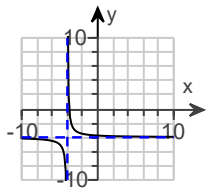
D.



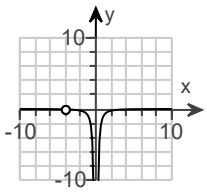
8. If f represents a function, only one of the graph choices presented will have a single solution to the equation $f(x) = -4$. Which one is it?

Choose the correct graph below.

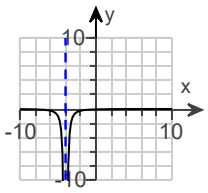
A.



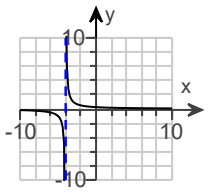
B.



C.



D.



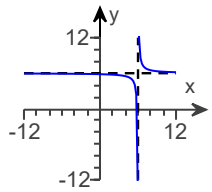
9. Use the graphs of the rational functions in A to D on the right to answer the question. Give all possible answers, as there may be more than one correct choice.

Which choices have the x-axis as a horizontal asymptote?

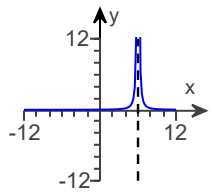
Select all the graphs that apply.

- [ ] Graph C
- [ ] Graph B
- [ ] Graph A
- [ ] Graph D

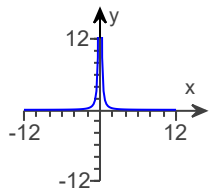
A.



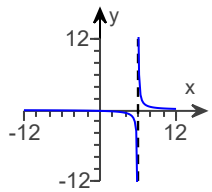
B.



C.



D.

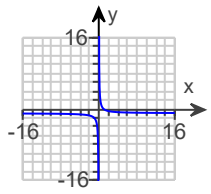


10. Explain how the graph of the function $f(x) = \frac{1}{x+1}$ can be obtained from the graph of $y = \frac{1}{x}$. Then graph f and give the (a) domain and (b) range. Determine the largest open intervals of the domain over which the function is (c) increasing or (d) decreasing.

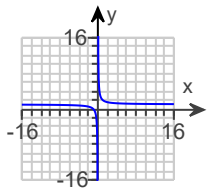
To obtain the graph of f, shift the graph of $y = \frac{1}{x}$ (1) _____ _____ unit(s).

Graph the function $f(x) = \frac{1}{x+1}$. Choose the correct graph below.

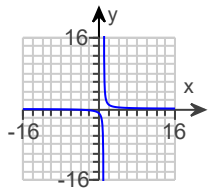
A.



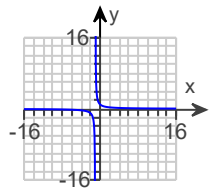
B.



C.



D.



(a) The domain of f(x) is _____.
(Type your answer in interval notation.)

(b) The range of f(x) is _____.
(Type your answer in interval notation.)

(c) Determine the largest open intervals of the domain over which the function is increasing. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The function is increasing on _____.
(Type your answer in interval notation. Use a comma to separate answers as needed.)

B. There is no interval of the domain for which the function is increasing.

(d) Determine the largest open intervals of the domain over which the function is decreasing. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The function is decreasing on _____.
(Type your answer in interval notation. Use a comma to separate answers as needed.)

B. There is no interval of the domain for which the function is decreasing.

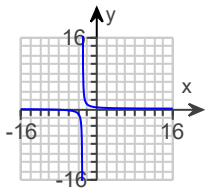
(1)
- up
- to the left
- down
- to the right

11. Explain how the graph of the function $f(x)=\frac{1}{x}+4$ can be obtained from the graph of $y=\frac{1}{x}$. Then graph f and give the (a) domain and (b) range. Determine the largest open intervals of the domain over which the function is (c) increasing or (d) decreasing.

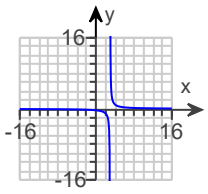
To obtain the graph of f, shift the graph of $y=\frac{1}{x}$ (1) _____ _____ unit(s).

Graph the function $f(x)=\frac{1}{x}+4$. Choose the correct graph below.

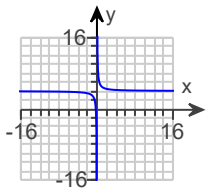
A.



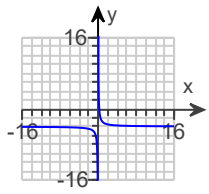
B.



C.



D.



(a) The domain of f(x) is _____.
(Type your answer in interval notation.)

(b) The range of f(x) is _____.
(Type your answer in interval notation.)

(c) Determine the largest open intervals of the domain over which the function is increasing. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The function is increasing on _____.
(Type your answer in interval notation. Use a comma to separate answers as needed.)

B. There is no interval of the domain for which the function is increasing.

(d) Determine the largest open intervals of the domain over which the function is decreasing. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The function is decreasing on _____.
(Type your answer in interval notation. Use a comma to separate answers as needed.)

B. There is no interval of the domain for which the function is decreasing.

(1) down
up
to the left
to the right

12. Match the rational function with the appropriate description.

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

Choose the correct attribute of the rational function.

- **A.** The vertical asymptote is $x = -4$.
- **B.** The y-intercept is (0,7).
- **C.** The vertical asymptote is $x = -7$.
- **D.** The x-intercept is (4,0).

13. Identify the appropriate description for the following rational function.

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

Choose the correct description below.

- **A.** The x-intercept is (2,0).
- **B.** The vertical asymptote is $x = -1$.
- **C.** There is a "hole" in its graph at $x = -2$.
- **D.** The horizontal asymptote is $y = 2$.
- **E.** The graph has an oblique asymptote.
- **F.** The x-axis is its horizontal asymptote, and the y-axis is its vertical asymptote.
- **G.** The y-intercept is (0,1).
- **H.** The x-axis is its horizontal asymptote, and the y-axis is not its vertical asymptote.

14. Match the rational function with the appropriate description below.

$$f(x) = \frac{x^2 - 16}{x - 4}$$

Choose the correct attribute of the rational function.

- **A.** The horizontal asymptote is $y = 4$.
- **B.** There is a "hole" in the graph at $x = 4$.
- **C.** The vertical asymptote is $x = 4$.
- **D.** The graph has the oblique asymptote $y = x - 4$.

15. Identify the appropriate description for the following rational function.

$$f(x) = \frac{x^2 + x + 2}{x - 5}$$

Choose the correct description below.

- **A.** The x-axis is its horizontal asymptote, and the y-axis is not its vertical asymptote.
- **B.** The vertical asymptote is $x = -1$.
- **C.** There is a "hole" in its graph at $x = -1$.
- **D.** The graph has an oblique asymptote.
- **E.** The x-intercept is $(-5,0)$.
- **F.** The x-axis is its horizontal asymptote, and the y-axis is its vertical asymptote.
- **G.** The y-intercept is $(0,1)$.
- **H.** The horizontal asymptote is $y = 5$.

16. Give the equations of any vertical, horizontal, or oblique asymptotes for the graph of the rational function.

$$f(x) = \frac{7}{x - 5}$$

Identify any vertical asymptotes. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** There is one vertical asymptote. Its equation is _____.
  (Type an equation.)
- **B.** There are two vertical asymptotes. The equation of the leftmost one is _____ and the equation of the rightmost one is _____.
  (Type equations.)
- **C.** There are no vertical asymptotes.

Identify the horizontal or oblique asymptote, if one exists. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The function has a horizontal asymptote whose equation is _____.
  (Type an equation.)
- **B.** The function has an oblique asymptote whose equation is _____.
  (Type an equation.)
- **C.** The function has neither a horizontal nor an oblique asymptote.

17. Give the equations of any vertical, horizontal, or oblique asymptotes for the graph of the rational function.

$$f(x) = \frac{x^2 - 5}{x + 5}$$

Select the correct answer below and, if necessary, fill in the answer box to complete your choice.

- **A.** The equation of the vertical asymptote is x = _____.
  (Type an integer or a simplified fraction.)
- **B.** There is no vertical asymptote.

Select the correct answer below and, if necessary, fill in the answer box to complete your choice.

- **A.** The equation of the horizontal asymptote is y = _____.
  (Type an integer or a simplified fraction.)
- **B.** There is no horizontal asymptote.

Select the correct answer below and, if necessary, fill in the answer box to complete your choice.

- **A.** The equation of the oblique asymptote is y = _____.
  (Type an integer or a simplified fraction.)
- **B.** There is no oblique asymptote.

18. Give the equations of any vertical, horizontal, or oblique asymptotes for the graph of the rational function.

$$f(x) = \frac{x^2 - 3x - 4}{2x^2 - x - 10}$$

Select the correct choice below and fill in any answer boxes within your choice.

- **A.** The vertical asymptotes are x = _____.
  (Use a comma to separate answers as needed.)
- **B.** There is no vertical asymptote.

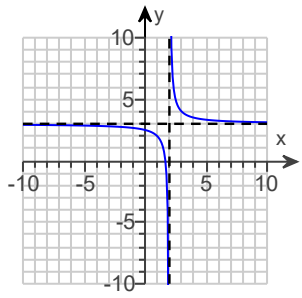
Select the correct choice below and fill in any answer boxes within your choice.

- **A.** The horizontal asymptote is y = _____.
  (Use a comma to separate answers as needed.)
- **B.** There is no horizontal asymptote.

Select the correct choice below and fill in any answer boxes within your choice.

- **A.** The oblique asymptote is y = _____.
- **B.** There is no oblique asymptote.

19. Identify any vertical, horizontal, or oblique asymptotes in the graph of y = f(x). State the domain of f.



Identify any vertical asymptotes. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

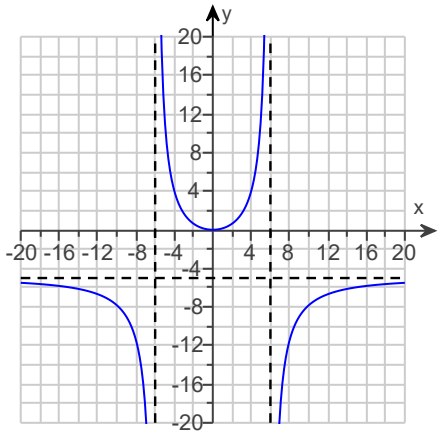
- **A.** There is one vertical asymptote. Its equation is _____.
  (Type an equation. Use integers or fractions for any numbers in the equation.)
- **B.** There are two vertical asymptotes. The equation of the leftmost one is _____ and the equation of the rightmost one is _____.
  (Type equations. Use integers or fractions for any numbers in the equations.)
- **C.** There are no vertical asymptotes.

Identify the horizontal asymptote if one exists. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The equation of the horizontal asymptote is _____.
  (Type an equation. Use integers or fractions for any numbers in the equation.)
- **B.** The equation of the oblique asymptote is _____.
  (Type an equation in slope-intercept form. Use integers or fractions for any numbers in the equation.)
- **C.** There is no horizontal asymptote.

The domain of f is _____.
(Type your answer in interval notation.)

20. Identify any vertical, horizontal, or oblique asymptotes in the graph of y = f(x). State the domain of f.



Identify any vertical asymptotes. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

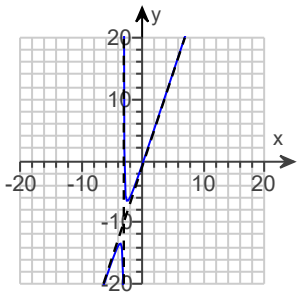
- **A.** There is only one vertical asymptote. Its equation is _____.
  (Type an equation.)
- **B.** There are two vertical asymptotes. The equation of the leftmost one is _____, and the equation of the rightmost one is _____.
  (Type an equation.)
- **C.** There are no vertical asymptotes.

Identify any horizontal or oblique asymptotes. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The function has a horizontal asymptote whose equation is _____.
  (Type an equation.)
- **B.** The function has an oblique asymptote whose equation is, _____.
  (Type an equation.)
- **C.** The function has neither a horizontal nor an oblique asymptote.

The domain of f is _____.
(Type your answer in interval notation.)

21. Identify any vertical, horizontal, or oblique asymptotes in the graph of y = f(x). State the domain of f.



Identify any vertical asymptotes. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** There is one vertical asymptote. Its equation is _____.
  (Type an equation.)
- **B.** There are two vertical asymptotes. The equation of the leftmost one is _____ and the equation of the rightmost one is _____.
  (Type equations.)
- **C.** There are no vertical asymptotes.

Identify the horizontal or oblique asymptote if one exists. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The equation of the horizontal asymptote is _____.
  (Type an equation.)
- **B.** The equation of the oblique asymptote is _____.
  (Type an equation in slope-intercept form.)
- **C.** There is no horizontal asymptote.

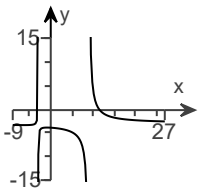
The domain is _____.
(Type your answer in interval notation.)

22. Sketch the graph of the rational function.

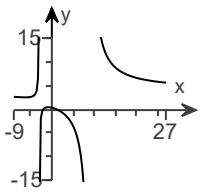
$$f(x) = \frac{4x^2 + 4x - 8}{x^2 - 6x - 27}$$

Choose the correct graph of the given rational function.

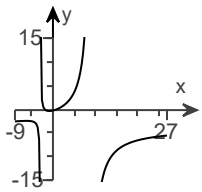
A.



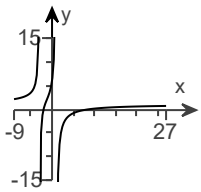
B.



C.



D.

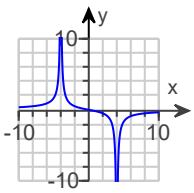


23. Graph the rational function.

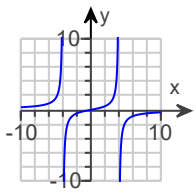
$$f(x) = \frac{-3x}{x^2 - 16}$$

Choose the correct graph.

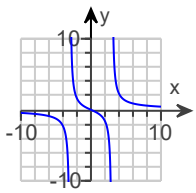
A.



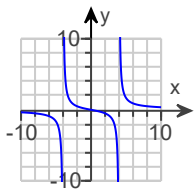
B.



C.



D.

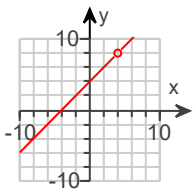


24. Graph the rational function.

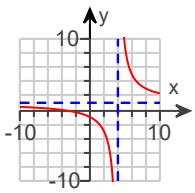
$$f(x) = \frac{x^2 - 16}{x - 4}$$

Choose the graph of the function.

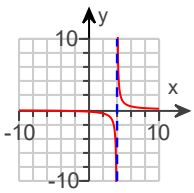
A.



B.



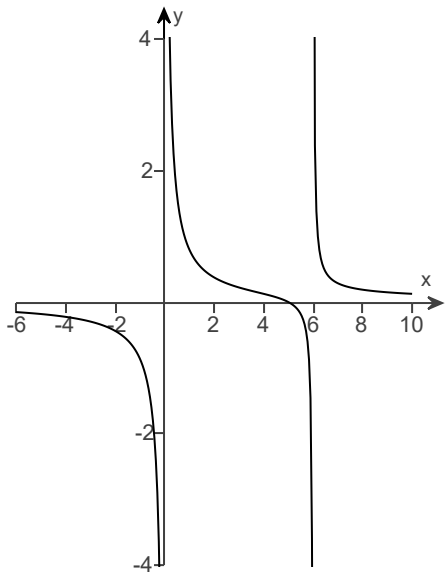
C.



25. Find an equation for the rational function graph.

Choose the correct function for the graph.

- $f(x) = \frac{x - 5}{x(x - 6)}$
- $f(x) = \frac{x}{(x - 5)(x - 6)}$
- $f(x) = \frac{x(x - 6)}{x - 5}$
- $f(x) = \frac{x - 5}{x - 6}$



26. Find a possible equation for the function with a graph having the given features.

x-intercepts, $(-7,0)$ and $(3,0)$, y-intercept, $(0,-21)$, vertical asymptote, $x=1$, horizontal asymptote, $y=1$

Choose the possible equation for the function.

- $f(x)=\dfrac{(x-3)}{(x-1)^2}$
- $f(x)=\dfrac{(x-1)^2}{(x-3)(x+7)}$
- $f(x)=\dfrac{(x-3)(x+7)}{(x-1)^2}$
- $f(x)=\dfrac{(x-3)(x+7)}{(x-1)}$

27. If x varies directly as y, and $x=21$ when $y=3$, find x when $y=6$.

$x=$ _____

28. If z varies inversely as w, and $z=12$ when $w=7$, find z when $w=2$.

$z=$ _____

29. Let a be directly proportional to m and n^2, and inversely proportional to y^3. If $a=4$ when $m=9$, $n=4$, and $y=2$, find a when $m=3$, $n=3$, and $y=7$.

$a=$ _____ (Type an integer or a simplified fraction.)

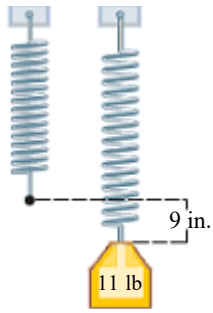
30. Write the following formula as an English phrase using the word varies or proportional.

$C=2\pi r$, where C is the circumference of a circle of radius r

Choose the correct answer below.

- **A.** The circumference of a circle varies directly as its radius.
- **B.** The circumference of a circle varies inversely as its radius.

31. Hooke's law for an elastic spring states that the distance a spring stretches varies directly as the force applied. If a force of 11 lb stretches a certain spring 9 in., how much will a force of 33 lb stretch the spring?



A 33-pound force will stretch the spring _____ in.