SM 3H

2023-2024

3.3 Properties of Rational Functions

SCORE: /

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

1. For a rational function R, if the degree of the numerator is less than the denominator, then R is a _____ fraction.

2. **True or False** The graph of a rational function may intersect a horizontal asymptote.

3. **True or False** The graph of a rational function may intersect a vertical asymptote.

4. If a rational function is proper, then _____ is a horizontal asymptote.

Find the domain of each rational function.

5. $R(x)=\dfrac{4x}{x-3}$

6. $H(x)=\dfrac{-4x^2}{(x-2)(x+4)}$

7. $F(x)=\dfrac{3x(x-1)}{2x^2-5x-3}$

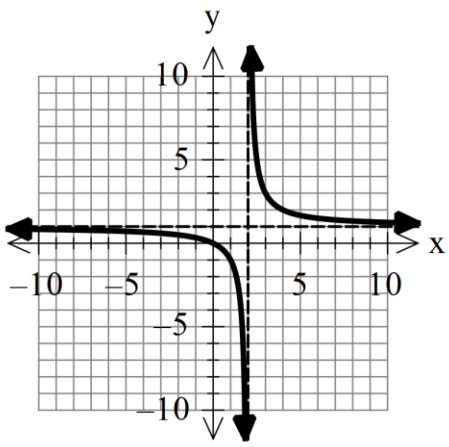
8. $R(x)=\dfrac{x}{x^3-8}$

9. $R(x)=\dfrac{3x^2+x}{x^2+4}$

10. $R(x)=\dfrac{3(x^2-x-6)}{4(x^2-9)}$

Use the graphs shown to find a) the domain and range of each function b) the intercepts, if any c) Horizontal asymptotes, if any d) Vertical asymptotes, if any e) Oblique asymptotes, if any.

11.



Domain:

Range:

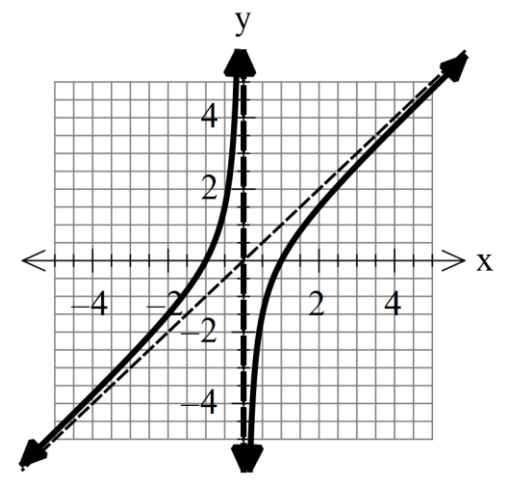
Intercepts (x and y):

Horizontal Asymptotes:

Vertical Asymptotes:

Oblique Asymptotes:

12.



Domain:

Range:

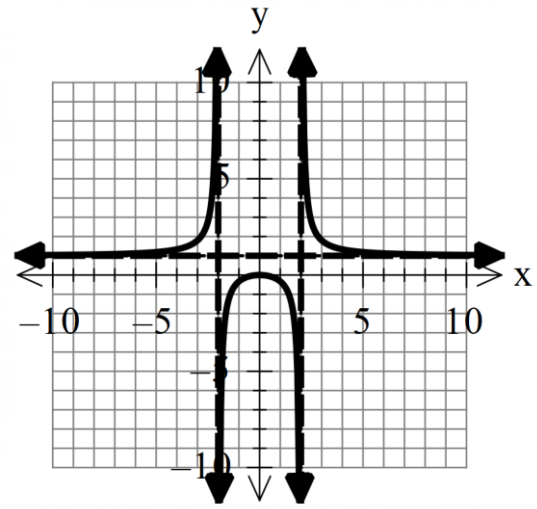
Intercepts (x and y):

Horizontal Asymptotes:

Vertical Asymptotes:

Oblique Asymptotes:

13.



Domain:

Range:

Intercepts (x and y):

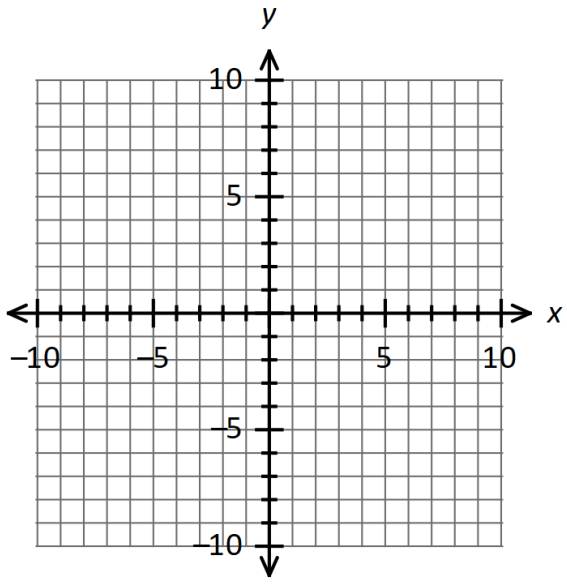
Horizontal Asymptotes:

Vertical Asymptotes:

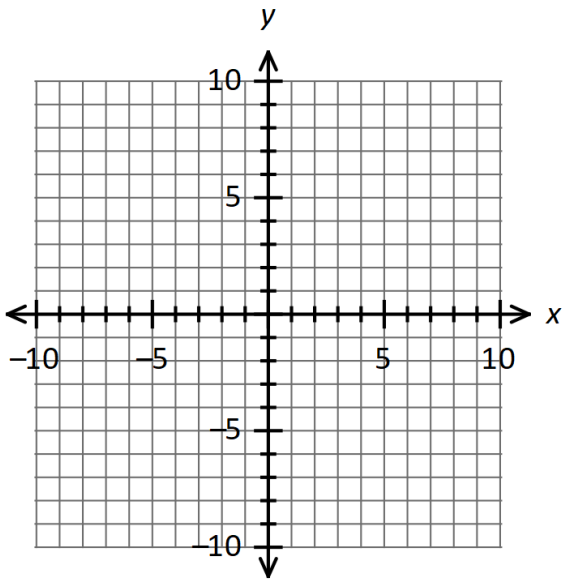
Oblique Asymptotes:

Graph each rational function using transformations. Start with a table from the parent graph, then make a table for the transformed function.

14. $R(x) = \dfrac{1}{(x-1)}$



15. $G(x) = 1 + 2\left(\dfrac{1}{(x-3)}\right)$



Find the vertical, horizontal, and oblique asymptotes, if any, of each rational function.

16. $R(x) = \dfrac{3x}{x+4}$

17. $H(x) = \dfrac{x^3 - 8}{x^2 - 5x + 6}$

18. $R(x) = \dfrac{x^3}{x^4 - 1}$

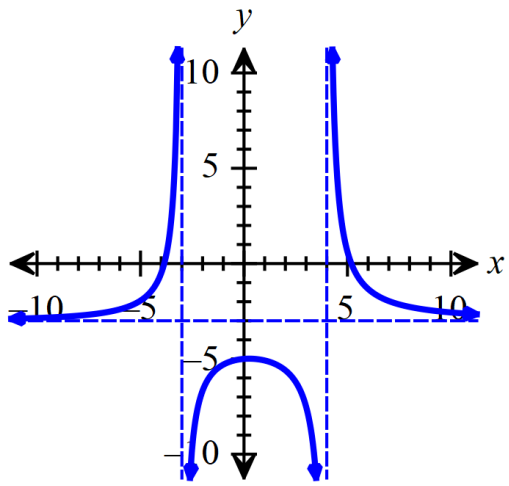
19. $T(x) = \dfrac{2x^2 - 5x - 12}{3x^2 - 11x - 4}$

20. $P(x) = \dfrac{6x^2 + 7x - 5}{3x + 5}$

21. $Q(x) = \dfrac{x^4 - 1}{x^2 - x}$

Given the graphs of functions below, determine the key features.

22.



Domain:

Range:

x-intercept(s):

y-intercept:

Increasing:

Decreasing:

Constant:

Vertical Asymptote(s):

Positive:

Negative:

Maximums / minimums:

Symmetry:

End Behavior/Limits:

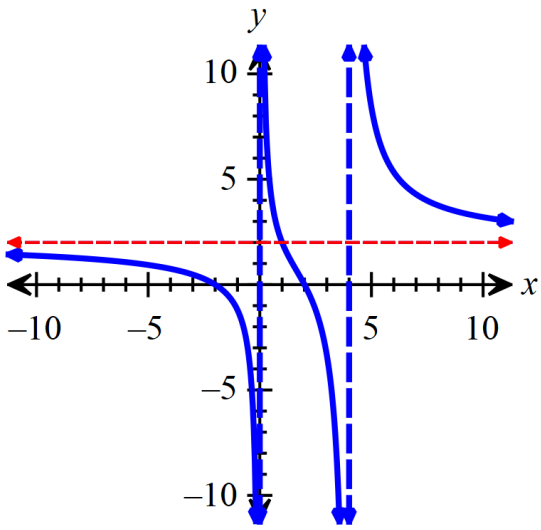
$\lim_{x\to-\infty} f(x) =$ $\lim_{x\to\infty} f(x) =$

$\lim_{x\to-3^-} f(x) =$ $\lim_{x\to-3^+} f(x) =$

$\lim_{x\to4^-} f(x) =$ $\lim_{x\to4^+} f(x) =$

Horizontal Asymptote:

23.



Domain:

Range:

x-intercept(s):

y-intercept:

Increasing:

Decreasing:

Constant:

Vertical Asymptote(s):

Positive:

Negative:

Maximums / minimums:

Symmetry:

End Behavior/Limits:

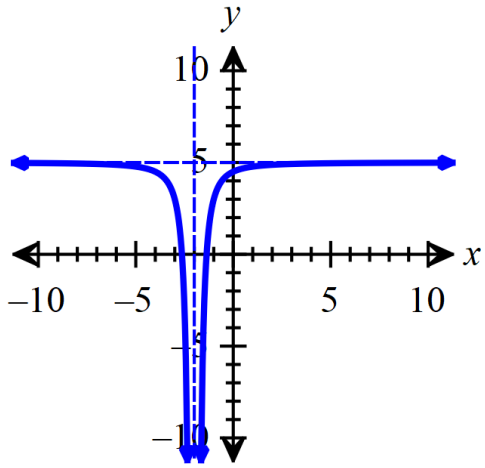
$\lim_{x\to-\infty} f(x) =$ $\lim_{x\to\infty} f(x) =$

$\lim_{x\to0^-} f(x) =$ $\lim_{x\to0^+} f(x) =$

$\lim_{x\to4^-} f(x) =$ $\lim_{x\to4^+} f(x) =$

Horizontal Asymptote:

24.



Domain:

Range:

x-intercept(s):

y-intercept:

Increasing:

Decreasing:

Constant:

Vertical Asymptote(s):

Positive:

Negative:

Maximums / minimums:

Symmetry:

End Behavior/Limits:

$\lim_{x\to-\infty} f(x) =$ $\lim_{x\to\infty} f(x) =$

$\lim_{x\to-2^-} f(x) =$ $\lim_{x\to-2^+} f(x) =$

Horizontal Asymptote:

Review

25. If $f(x) = 3x^2 + 5x$, answer the following:

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 $f(x) = -2$, 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*.

Simplify.

26. $\dfrac{6x^2-47x-8}{x-8}$

27. $\dfrac{x^2+x-6}{x^2+5x+4} \cdot \dfrac{3x^2+14x+8}{2x^2+7x+3}$