



2023-2024

3.4 The Graph of a Rational Function

SCORE: /

Name _____ Date _____ Period _____

1. The graph of a rational function never intersects a _____ asymptote.
2. **True or False** The graph of a rational function sometimes intersects an oblique asymptote.
3. **True or False** The graph of a rational function sometimes has a hole.

Use the following information to graph the rational equations without technology and determine the domain.

4. $f(x) = \frac{x+2}{x-6}$

vertical asymptotes

$x = 6$

horizontal asymptotes

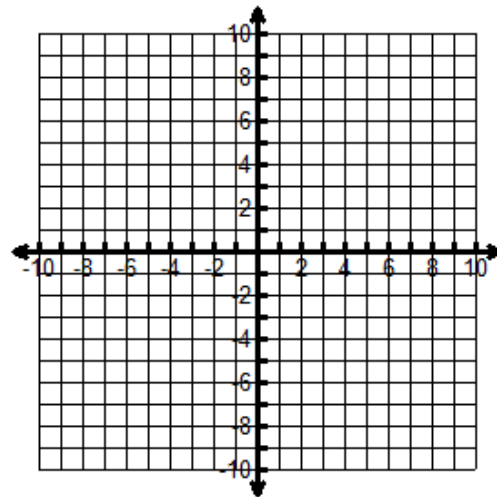
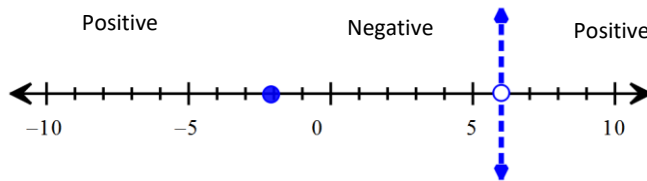
$y = 1$

x-intercepts

$(-2, 0)$

y-intercepts

$(0, -\frac{1}{3})$



Domain:

$$5. f(x) = \frac{x^2+x-30}{3x^2-12}$$

vertical asymptotes

$$x = 2, x = -2$$

horizontal asymptotes

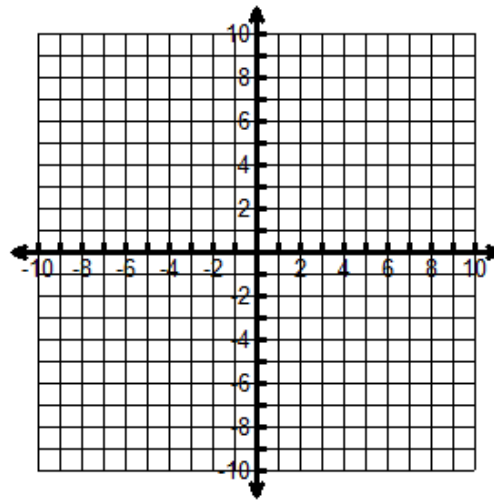
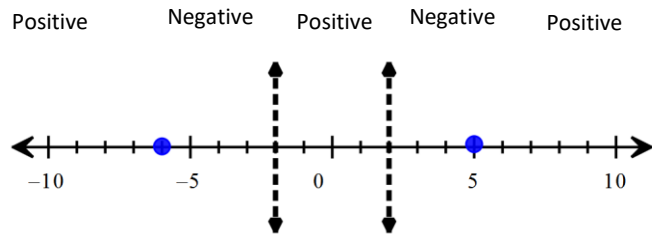
$$y = \frac{1}{3}$$

x-intercepts

$$(-6, 0), (5, 0)$$

y-intercepts

$$\left(0, \frac{5}{2}\right)$$

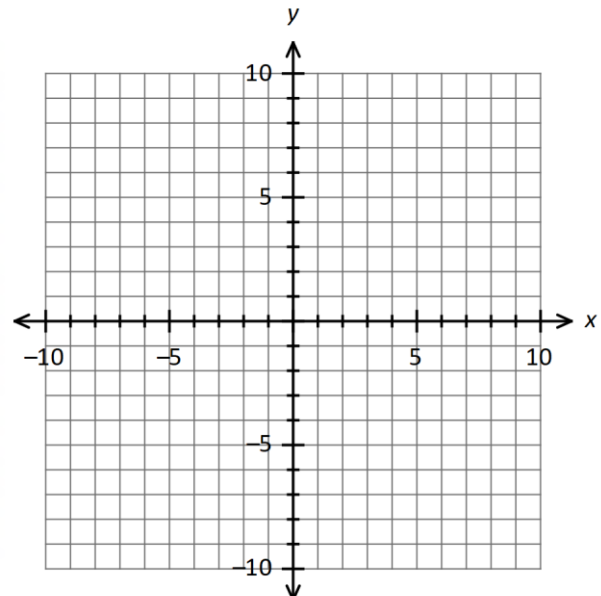


Domain:

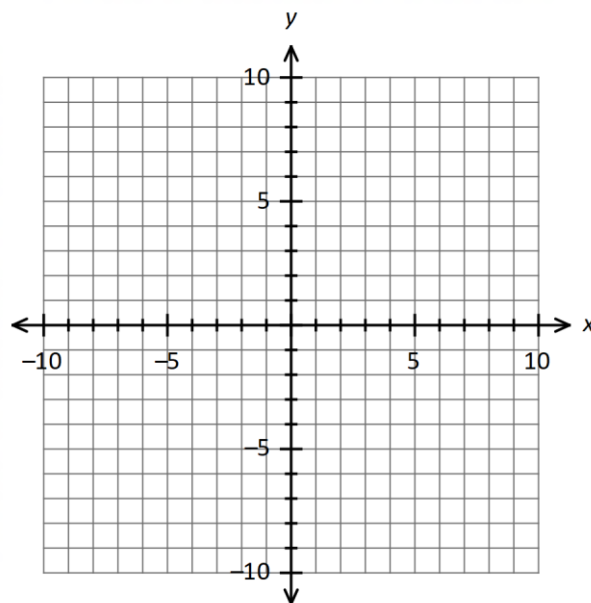
Analyze the graph of each function by following the given steps.

- 1) Factor the numerator and denominator of the function. Find the domain.
- 2) Write the function in lowest terms.
- 3) Locate the intercepts of the graph. The x -intercepts are the zeros of the numerator of the function that are in the domain of the function. The y -intercept is the constant of the numerator and denominator.
- 4) Determine the vertical asymptotes. Graph each vertical asymptote using a dashed line.
- 5) Determine the horizontal or oblique asymptote, if one exists. Graph the asymptote with a dashed line.
- 6) Use the zeros of the numerator and denominator of the function to divide the x -axis into intervals. Determine where the graph is above or below the x -axis by making a sign array.
- 7) Use the results from above to graph the function.

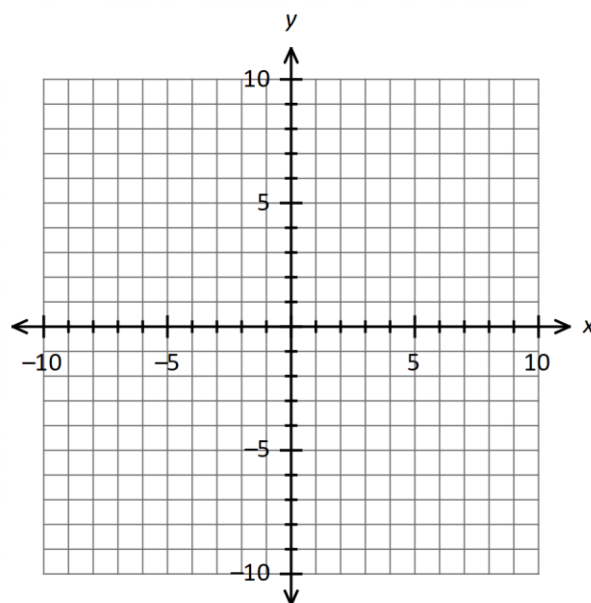
$$6. R(x) = \frac{3x+3}{2x+4}$$



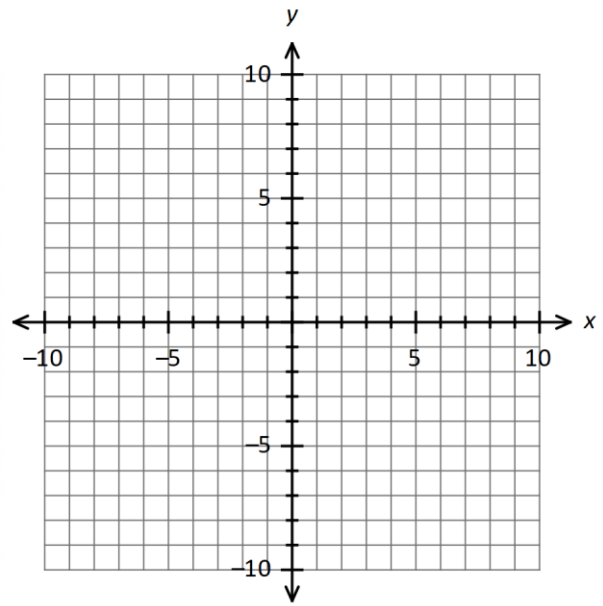
7. $R(x) = \frac{3}{x^2 - 4}$



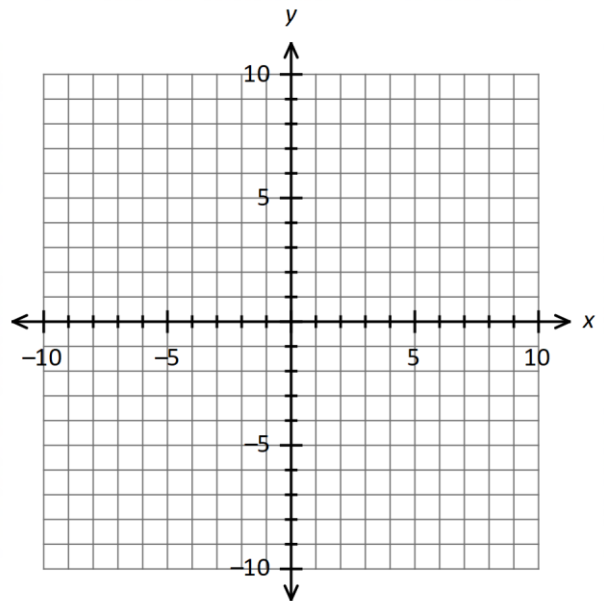
8. $R(x) = \frac{-x^2 - 5x + 6}{x^2 - 1}$



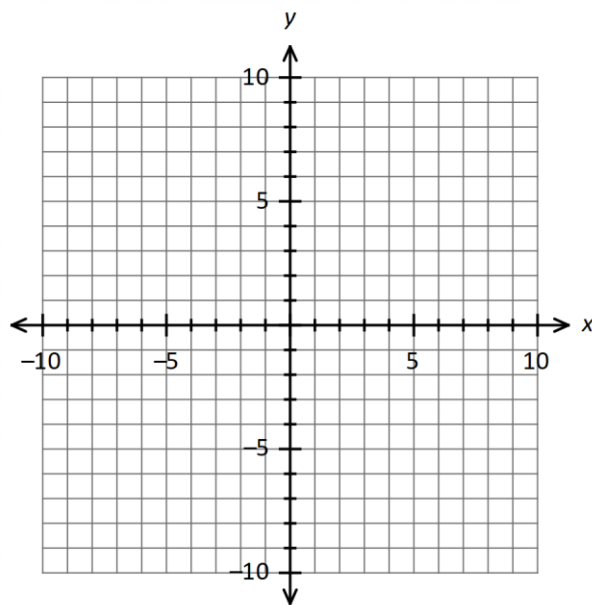
9. $R(x) = \frac{x^3 - 1}{x^2 - 9}$



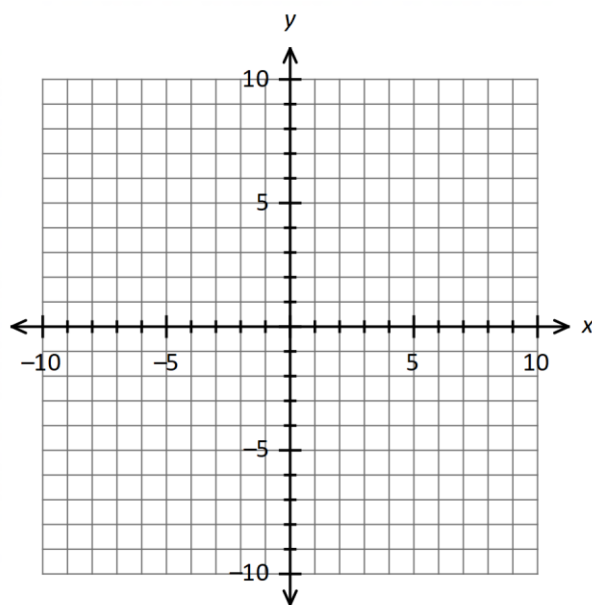
10. $R(x) = \frac{x^2}{x^2 + x - 6}$



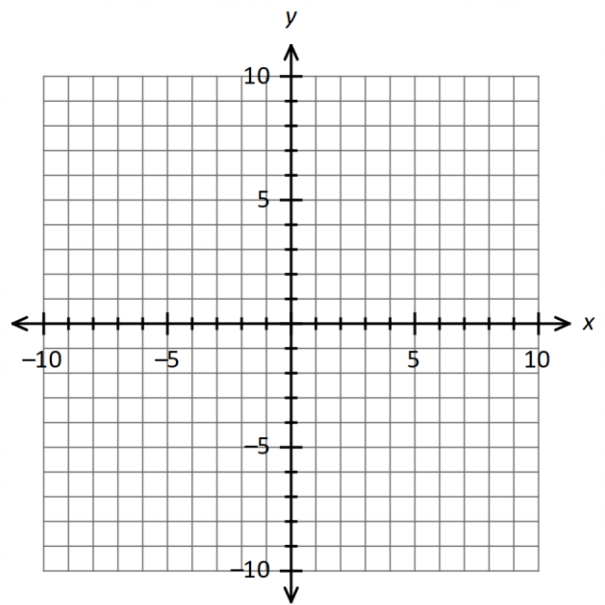
11. $R(x) = \frac{x^2 - 1}{x^4 - 16}$



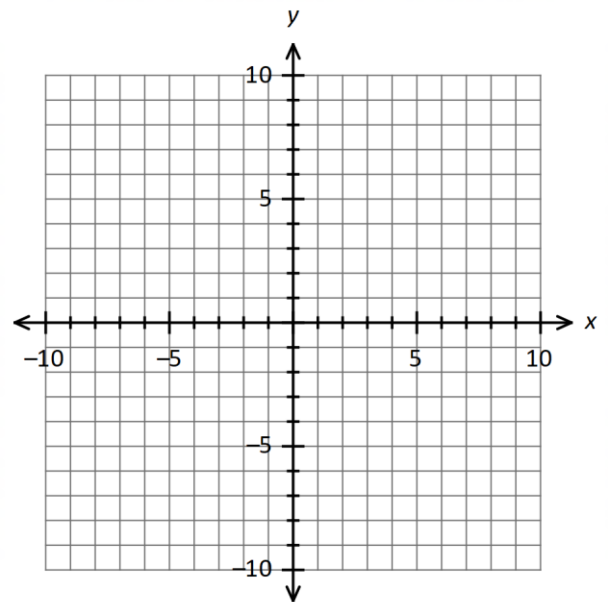
12. $R(x) = \frac{x^2 - 3x - 4}{x + 2}$



13. $R(x) = \frac{x^2 + x - 12}{x - 4}$

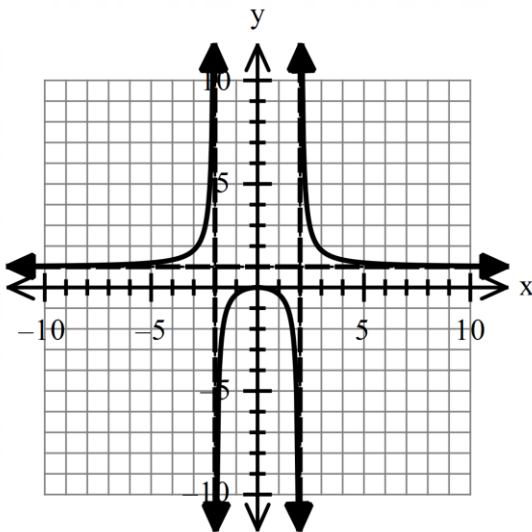


14. $R(x) = \frac{x^2 + x - 12}{x^2 - x - 6}$

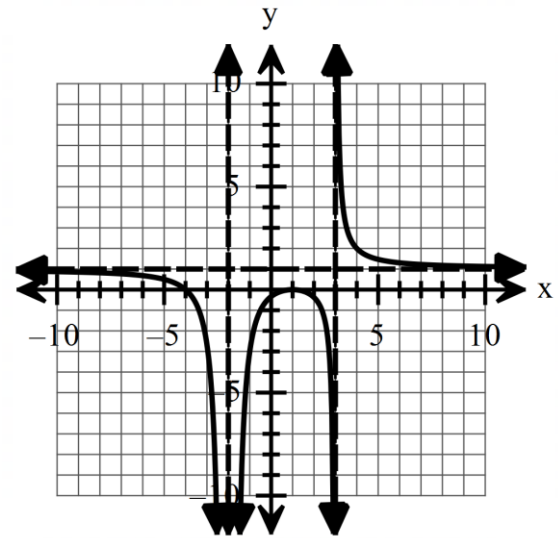


Find a rational function that might have the given graph. (More than one answer might be possible.)

15.



16.



Review

Factor completely.

17. $3x^2 + 13x + 12$

18. $27x^3 - 8$

19. $4x^2 - 81$

20. Find the function that is finally graphed after each of the following transformations is applied to the graph of $y = \sqrt{x}$. Reflect over the x -axis, horizontal stretch by a factor of 2, shift right 3 units, shift down 4 units.

21. Sketch the graph of the following function using transformations. Start with the parent table, list the transformations, make the table for the transformed function, and then graph the new function.

$$f(x) = 3(x - 2)^2 + 1$$

