

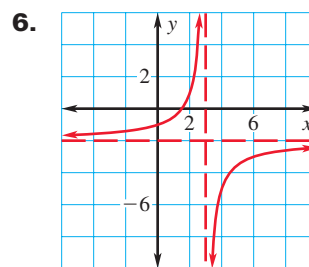
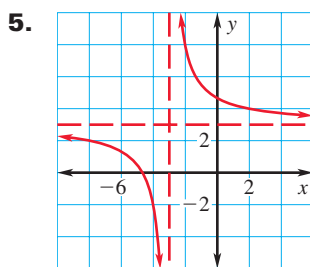
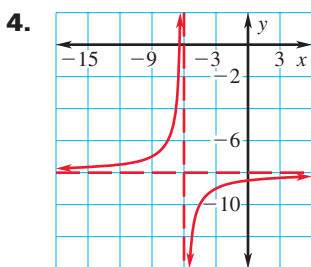
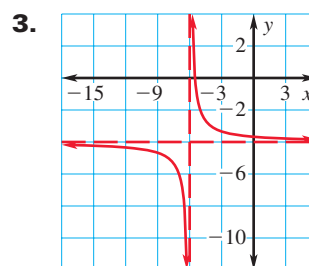
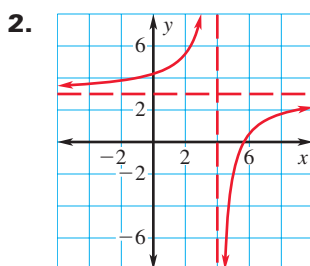
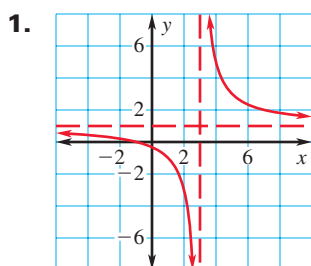


MM1A1b Graph the basic functions $f(x) = x^n$, where $n = 1$ to 3, $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.

MM1A1c Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x - and y -axes.

MM1A1d Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.

Identify the domain and range of the function from its graph.



7. **Multiple Choice** For which function is the domain all real numbers except -6 and the range all real numbers except 0 ?

A. $y = \frac{6}{x}$

B. $y = \frac{6}{x-6}$

C. $y = \frac{6}{x+6}$

D. $y = \frac{-6}{x-6}$

8. Graph $y = \frac{1}{x}$. Identify the domain and range of the function.

Graph the function and identify its domain and range. Then compare the graph with the graph of $y = \frac{1}{x}$.

9. $y = \frac{5}{x}$

10. $y = \frac{1}{6x}$

11. $y = \frac{-3}{2x}$

12. $y = \frac{1}{x} - 7$

13. $y = \frac{1}{x} + 10$

14. $y = \frac{1}{x-4}$

15. **Open-Ended** Give an example of a rational function whose graph has the same horizontal asymptote as the graph of $y = \frac{1}{x}$.

Exercise Set A *(continued)*

Determine the asymptotes of the graph of the function.

16. $y = \frac{10}{x-6} + 4$

17. $y = \frac{-8}{x+5} - 6$

18. $y = \frac{14}{x-3} - 8$

19. $y = \frac{12}{x+7} + 7$

20. $y = \frac{-4}{x-8} + 12$

21. $y = \frac{9}{x+5} + 10$

22. $y = \frac{14}{x-14} + 1$

23. $y = \frac{-12}{x+12} - 3$

24. $y = \frac{7}{x-5} - 14$

25. **Error Analysis** Describe and correct the error in identifying the asymptotes of the graph of $y = \frac{3}{x+1} - 5$.

Vertical asymptote: $x = 1$

Horizontal asymptote: $y = -5$



Graph the function.

26. $y = \frac{2}{x} + 5$

27. $y = \frac{1}{x-4} + 2$

28. $y = \frac{-3}{x+6} - 1$

29. **Multiple Representations** Your movie rental membership lets you rent any number of movies for \$28 per month. You rent at least 2 movies per month.

- Writing an Equation** Write an equation that gives the average cost C (in dollars per rental) as a function of the number r of additional rentals beyond 2 rentals.
- Drawing a Graph** Graph the equation from part (a). Then use the graph to approximate the number of additional rentals needed per month so that the average cost is \$2 per rental.

30. **Baseball Hall of Fame** Your baseball team is planning a bus trip to the National Baseball Hall of Fame. The cost for renting a bus is \$515, and the cost will be divided equally among the people who are going on the trip. One admission costs \$14.50.

- Write an equation that gives the cost C (in dollars per person) of the trip as a function of the number p of people going on the trip.
- Graph the equation.
- What would the cost per person be if 20 people go on the trip?

31. **Fundraiser** A pizza shop makes pizzas that organizations sell for fundraisers. One organization has placed an order for 450 pizzas. Currently, 4 people are scheduled to put together the pizzas. The owner of the shop hopes to call in some extra workers to complete all of the pizzas.

- Write an equation that gives the average number n of pizzas made per person as a function of the number p of extra workers that can come in and help complete the work.
- Graph the equation.
- If 2 people come in to help out, what is the average number of pizzas made per person?



- MM1A1b** Graph the basic functions $f(x) = x^n$, where $n = 1$ to 3, $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.
- MM1A1c** Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x - and y -axes.
- MM1A1d** Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.

Graph the function and identify its domain and range. Then compare the graph with the graph of $y = \frac{1}{x}$.

- | | | |
|--------------------------|------------------------|--------------------------|
| 1. $y = \frac{-1}{8x}$ | 2. $y = \frac{4}{5x}$ | 3. $y = \frac{-5}{3x}$ |
| 4. $y = \frac{-2}{3x}$ | 5. $y = \frac{7}{2x}$ | 6. $y = \frac{1}{x} - 9$ |
| 7. $y = \frac{1}{x} + 5$ | 8. $y = \frac{1}{x-6}$ | 9. $y = \frac{1}{x+8}$ |

10. Multiple Choice For graph of which function has the same vertical asymptote as the graph of $y = \frac{3}{x+2}$?

- A. $y = \frac{1}{x} - 2$ B. $y = \frac{1}{x} + 2$ C. $y = \frac{1}{x-2}$ D. $y = \frac{1}{x+2}$

Determine the asymptotes of the graph of the function.

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|--------------------------------|------------------------------|--------------------------------|
| 11. $y = \frac{22}{x+13} - 10$ | 12. $y = \frac{4}{4x-8} + 2$ | 13. $y = \frac{-10}{5x+5} - 3$ |
|--------------------------------|------------------------------|--------------------------------|

Graph the function.

- | | | |
|------------------------------|------------------------------|------------------------------|
| 14. $y = \frac{4}{x-3} + 5$ | 15. $y = \frac{-2}{x+2} - 1$ | 16. $y = \frac{5}{x+4} + 2$ |
| 17. $y = \frac{-2}{x-4} - 4$ | 18. $y = \frac{3}{x+6} - 2$ | 19. $y = \frac{-4}{x+2} - 4$ |

Write an equation whose graph has the given asymptotes and passes through the given point.

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|------------------------------|-------------------------------|
| 20. $x = 7, y = 8; (2, 0)$ | 21. $x = -2, y = 5; (0, -2)$ |
| 22. $x = 3, y = -2; (6, -1)$ | 23. $x = -4, y = -4; (-5, 3)$ |

Exercise Set B *(continued)*

24. **Writing** Let f be a function of the form $f(x) = \frac{a}{x-h} + k$. Can you graph f if you know only two points on the graph? *Explain.*
25. **Geometry** The height h of a trapezoid is given by the formula $h = \frac{2A}{b_1 + b_2}$ where A is the area and b_1 and b_2 are the bases.
- Let $A = 40$ and $b_1 = 5$. Write h as a function of b_2 . Then graph the function and identify its domain and range.
 - Use the graph to approximate the value of b_2 when $h = 6$.
26. **Challenge** Describe how to find the asymptotes of the graph of $g(x) = \frac{3}{2x-4} + 7$. Then graph the function.
27. **Zoo Trip** A grade school is taking a trip to the zoo. A parent group of 6 people is responsible for putting together 225 box lunches for the trip. The group hopes to recruit extra people for the task. Write an equation that gives the average number n of box lunches made per person as a function of the number p of parents that can come in and help complete the task. Then graph the equation. How many people need to come in so that the average number of box lunches made per person is 15 box lunches?
28. **Multiple Representations** You rent video games from a web site for \$17.25 per month. You can rent any number of games per month, but you usually rent at least 4 games per month.
- Writing an Equation** Write an equation that gives the average cost C per rental as a function of the number r of additional rentals beyond 4 rentals.
 - Drawing a Graph** Graph the equation from part (a). Then use the graph to approximate the number of additional rentals needed per month so that the average cost is \$2.25.
29. **Challenge** To decide whether a person qualifies for a loan to buy a house, a lender uses the ratio r of the person's expected monthly housing expenses to monthly income. Suppose the person has a monthly income of \$4200 and expects to pay \$1200 per month in housing expenses. The person also expects to receive a raise of x dollars this month.
- Write and graph an equation that gives r as a function of x .
 - The person will qualify for a loan if the ratio is 0.28. What must the amount of the raise be in order for the person to qualify for a loan?