# Practice 9-3

**Find any points of discontinuity for each rational function.**

**1.** $y = \dfrac{x + 3}{(x - 4)(x + 3)}$

**2.** $y = \dfrac{x - 2}{x^2 - 4}$

**3.** $y = \dfrac{(x - 3)(x + 1)}{(x - 2)}$

**4.** $y = \dfrac{3x(x + 2)}{x(x + 2)}$

**5.** $y = \dfrac{2}{(x + 1)}$

**6.** $y = \dfrac{4x}{x^3 - 9x}$

**Find the horizontal asymptote of the graph of each rational function.**

**7.** $y = \dfrac{2}{x - 6}$

**8.** $y = \dfrac{x + 2}{x - 4}$

**9.** $y = \dfrac{(x + 3)}{2(x + 4)}$

**10.** $y = \dfrac{2x^2 + 3}{x^2 - 6}$

**11.** $y = \dfrac{3x - 12}{x^2 - 2}$

**12.** $y = \dfrac{3x^3 - 4x + 2}{2x^3 + 3}$

**Sketch the graph of each rational function.**

**13.** $y = \dfrac{3}{x - 2}$

**14.** $y = \dfrac{3}{(x - 2)(x + 2)}$

**15.** $y = \dfrac{x}{x(x - 6)}$

**16.** $y = \dfrac{2x}{x - 6}$

**17.** $y = \dfrac{x^2 - 1}{x^2 - 4}$

**18.** $y = \dfrac{2x^2 + 10x + 12}{x^2 - 9}$

**19.** $y = \dfrac{x}{x^2 + 4}$

**20.** $y = \dfrac{x + 2}{x - 1}$

**21.** $y = \dfrac{x + 3}{x + 1}$

**Describe the vertical asymptotes and holes for the graph of each rational function.**

**22.** $y = \dfrac{x - 2}{(x + 2)(x - 2)}$

**23.** $y = -\dfrac{x}{x(x - 1)}$

**24.** $y = \dfrac{5 - x}{x^2 - 1}$

**25.** $y = \dfrac{x^2 - 2}{x + 2}$

**26.** $y = \dfrac{x^2 - 4}{x^2 + 4}$

**27.** $y = \dfrac{x + 3}{x^2 - 9}$

**28.** $y = \dfrac{x^2 - 25}{x - 4}$

**29.** $y = \dfrac{(x - 2)(2x + 3)}{(5x + 4)(x - 3)}$

**30.** $y = \dfrac{15x^2 - 7x - 2}{x^2 - 4}$

**31.** Suppose you start a home business typing technical research papers for college students. You must spend $3500 to replace your computer system. Then you estimate the cost of typing each page will be $.02.

   **a.** Write a rational function modeling your average cost per page. Graph the function.

   **b.** How many pages must you type to bring your average cost per page to less than $1.50 per page, the amount you plan to charge?

   **c.** How many pages must you type to have the average cost per page equal $1.00?

   **d.** How many pages must you type to have the average cost per page equal $.50?

   **e.** What are the vertical and horizontal asymptotes of the graph of the function?