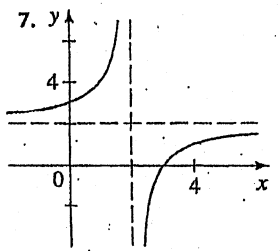
5.5

1–6 ■ Find the x- and y-intercepts of the rational function.

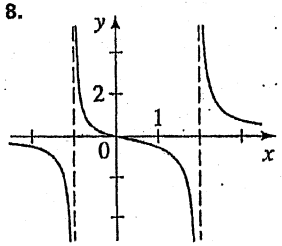
1. $r(x) = \dfrac{x-2}{x+3}$
2. $s(x) = \dfrac{2x}{3x+5}$
3. $t(x) = \dfrac{x^2-x-2}{x-6}$
4. $r(x) = \dfrac{2}{x^2+3x-4}$
5. $r(x) = \dfrac{x^2-9}{x^2}$
6. $r(x) = \dfrac{x^3+8}{x^2+4}$

7–8 ■ From the graph, determine the x- and y-intercepts and the vertical and horizontal asymptotes.

7.



8.



9–18 ■ Find all horizontal and vertical asymptotes (if any).

9. $r(x) = \dfrac{5}{x+3}$
10. $s(x) = \dfrac{3x+3}{x-3}$
11. $t(x) = \dfrac{x^2}{x^2-x-6}$
12. $r(x) = \dfrac{2x-4}{x^2+2x+1}$
13. $s(x) = \dfrac{6}{x^2+2}$
14. $t(x) = \dfrac{(x-1)(x-2)}{(x-3)(x-4)}$
15. $r(x) = \dfrac{6x-2}{x^2+5x-6}$
16. $s(x) = \dfrac{3x^2}{x^2+2x+5}$
17. $t(x) = \dfrac{x^2+2}{x-1}$
18. $r(x) = \dfrac{x^3+3x^2}{x^2-4}$

19–46 ■ Find the intercepts and asymptotes, and then sketch a graph of the rational function.

19. $r(x) = \dfrac{4}{x-2}$
20. $r(x) = \dfrac{9}{x+3}$
21. $r(x) = \dfrac{x-1}{x-2}$
22. $r(x) = \dfrac{x+9}{x-3}$
23. $r(x) = \dfrac{4x-4}{x+2}$
24. $r(x) = \dfrac{2x+6}{-6x+3}$
25. $s(x) = \dfrac{4-3x}{x+7}$
26. $s(x) = \dfrac{1-2x}{2x+3}$
27. $r(x) = \dfrac{18}{(x-3)^2}$
28. $r(x) = \dfrac{x-2}{(x+1)^2}$
29. $s(x) = \dfrac{4x-8}{(x-4)(x+1)}$
30. $s(x) = \dfrac{x+2}{(x+3)(x-1)}$
31. $s(x) = \dfrac{6}{x^2-5x-6}$
32. $s(x) = \dfrac{2x-4}{x^2+x-2}$
33. $t(x) = \dfrac{3x+6}{x^2+2x-8}$
34. $t(x) = \dfrac{x-2}{x^2-4x}$
35. $r(x) = \dfrac{(x-1)(x+2)}{(x+1)(x-3)}$
36. $r(x) = \dfrac{2x(x+4)}{(x-1)(x-2)}$
37. $r(x) = \dfrac{x^2-2x+1}{x^2+2x+1}$
38. $r(x) = \dfrac{4x^2}{x^2-2x-3}$
39. $r(x) = \dfrac{2x^2+10x-12}{x^2+x-6}$
40. $r(x) = \dfrac{2x^2+2x-4}{x^2+x}$
41. $r(x) = \dfrac{x^2-x-6}{x^2+3x}$
42. $r(x) = \dfrac{x^2+3x}{x^2-x-6}$
43. $r(x) = \dfrac{3x^2+6}{x^2-2x-3}$
44. $r(x) = \dfrac{5x^2+5}{x^2+4x+4}$
45. $s(x) = \dfrac{x^2-2x+1}{x^3-3x^2}$
46. $t(x) = \dfrac{x^3-x^2}{x^3-3x-2}$

47–54 ■ Find the slant asymptote, the vertical asymptotes, and sketch a graph of the function.

47. $r(x) = \dfrac{x^2}{x-2}$
48. $r(x) = \dfrac{x^2+2x}{x-1}$
49. $r(x) = \dfrac{x^2-2x-8}{x}$
50. $r(x) = \dfrac{3x-x^2}{2x-2}$
51. $r(x) = \dfrac{x^2+5x+4}{x-3}$
52. $r(x) = \dfrac{x^3+4}{2x^2+x-1}$
53. $r(x) = \dfrac{x^3+x^2}{x^2-4}$
54. $r(x) = \dfrac{2x^3+2x}{x^2-1}$

5.2

1–10 ■ Find the quotient and remainder using long division.

1. $\dfrac{x^2+4x-8}{x+3}$
2. $\dfrac{x^3-x^2-2x+6}{x-2}$
3. $\dfrac{x^3+6x+5}{x-4}$
4. $\dfrac{x^3+3x^2+4x+3}{3x+6}$
5. $\dfrac{x^3+6x+3}{x^2-2x+2}$
6. $\dfrac{3x^4-5x^3-20x-5}{x^2+x+3}$
7. $\dfrac{6x^3+2x^2+22x}{2x^2+5}$
8. $\dfrac{9x^2-x+5}{3x^2-7x}$
9. $\dfrac{x^6+x^4+x^2+1}{x^2+1}$
10. $\dfrac{2x^5-7x^4-13}{4x^2-6x+8}$

11–24 ■ Find the quotient and remainder using synthetic division.

11. $\dfrac{x^2-5x+4}{x-3}$
12. $\dfrac{x^2-5x+4}{x-1}$
13. $\dfrac{3x^2+5x}{x-6}$
14. $\dfrac{4x^2-3}{x+5}$
15. $\dfrac{x^3+2x^2+2x+1}{x+2}$
16. $\dfrac{3x^3-12x^2-9x+1}{x-5}$
17. $\dfrac{x^3-8x+2}{x+3}$
18. $\dfrac{x^4-x^3+x^2-x+2}{x-2}$
19. $\dfrac{x^5+3x^3-6}{x-1}$
20. $\dfrac{x^3-9x^2+27x-27}{x-3}$