HW 5.1.1: Rational Functions
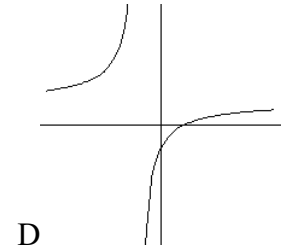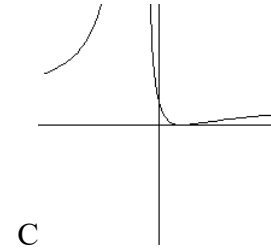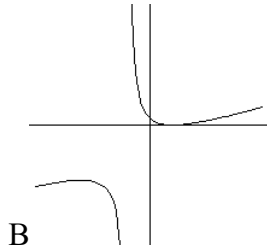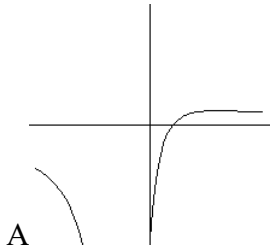
Match each equation form with one of the graphs. Assume c>d.

1. $f(x) = \dfrac{x-c}{x-d}$ 2. $g(x) = \dfrac{(x-c)^2}{x-d}$ 3. $h(x) = \dfrac{x-c}{(x-d)^2}$ 4. $k(x) = \dfrac{(x-c)^2}{(x-d)^2}$

A   B   C   D

For each function, find the x-intercepts, y-intercept, vertical asymptotes, end behavior (horizontal asymptotes), and holes if applicable. Use that information to sketch the graph.

5. $p(x) = \dfrac{3x-5}{x+2}$

6. $q(x) = \dfrac{x-5}{3x-1}$

7. $s(x) = \dfrac{4}{(x-2)^2}$

8. $r(x) = \dfrac{6}{(x+2)^2}$

9. $f(x) = \dfrac{3x^2-14x-5}{3x^2+8x-16}$

10. $g(x) = \dfrac{2x^2-11x+15}{3x^2-14x+15}$

11. $a(x) = \dfrac{x^2 + 2x - 3}{x^2 - 1}$

12. $b(x) = \dfrac{x^2 + 4x - 5}{x^2 - 25}$

13. $h(x) = \dfrac{2x^2 + x - 1}{x^2 - 4}$

14. $k(x) = \dfrac{3x^2 - x - 10}{x^2 + 2x - 3}$

15. $n(x) = \dfrac{3x^2 + 4x - 4}{x^3 - 4x^2}$

16. $m(x) = \dfrac{5 - x}{2x^2 + 5x + 3}$

17. $w(x) = \dfrac{(x-1)(x+3)(x-5)}{(x+2)^2 (x-4)}$

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

Write an equation for a rational function with the given characteristics.

19. Vertical asymptotes at $x = 5$ and $x = -5$

    x intercepts at $(2,0)$ and $(-1,0)$

    y intercept at $(0,4)$

20. Vertical asymptotes at $x = -3$ and $x = -2$

    x intercepts at $(2,0)$ and $(1,0)$

    y intercept at $(0,5)$

21. Vertical asymptotes at $x = -4$ and $x = -5$

    x intercepts at $(4,0)$ and $(-6,0)$

    Horizontal asymptote at $y = 7$

22. Vertical asymptotes at $x = -1$ and $x = 7$

    x intercepts at $(-5,0)$ and $(2,0)$

    Horizontal asymptote at $y = -3$

23. Vertical asymptote at $x = -1$

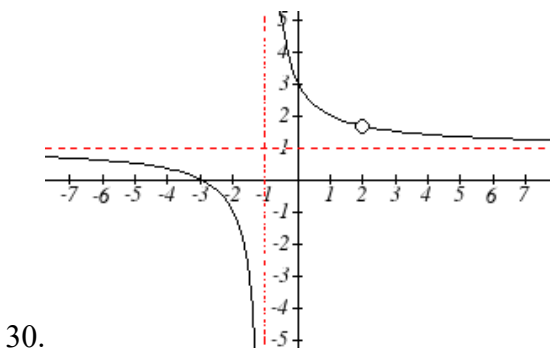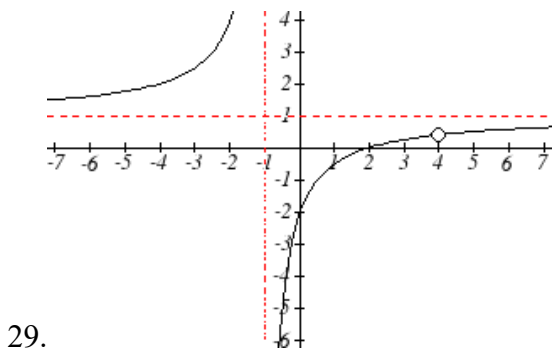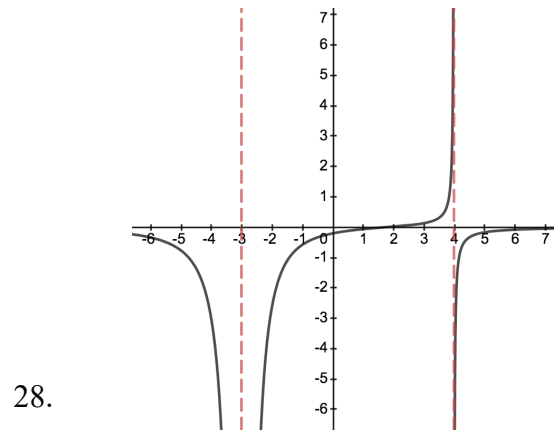   Double zero at $x = 2$
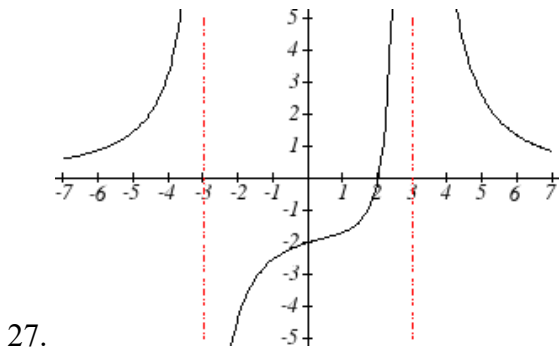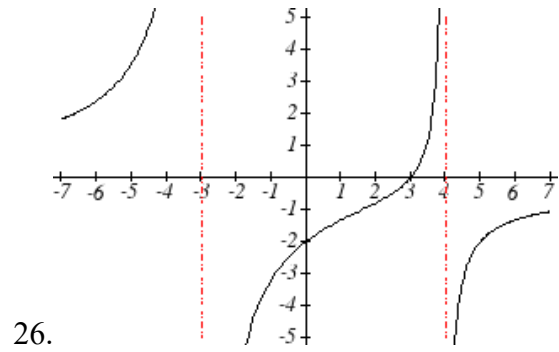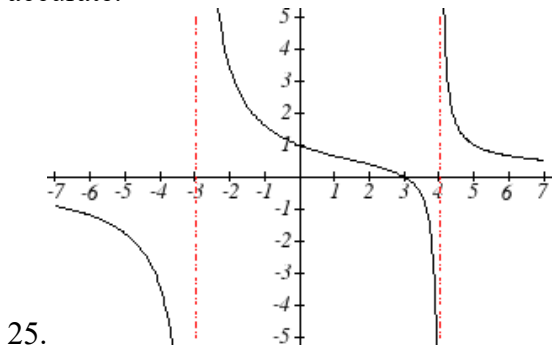
    y intercept at $(0,2)$

24. Vertical asymptote at $x = 4$

    Double zero at $x = -1$

    y intercept at $(0,3)$

Write a function for each graph. Answers will vary, but asymptote(s) and intercepts should be accurate.

25.

26.

27.

28.

29.

30.

Selected Answers:

1. D   2. B   3. A   4. C

5. Intercepts: $\left(\frac{5}{3},0\right),\left(0,-\frac{5}{2}\right)$

Vertical asymptotes: $x = -2$

Horizontal asymptotes: $y = 3$

Holes: none

7. Intercepts: $(0,1)$

Vertical asymptotes: $x = 2$

Horizontal asymptotes: $y = 0$

Holes: none

9. Intercepts: $\left(-\frac{1}{3},0\right),(5,0),\left(0,\frac{5}{16}\right)$

Vertical asymptotes: $x = -4$, $x = \frac{4}{3}$

Horizontal asymptotes: $y = 1$

Holes: none

11. Intercepts: $(-3,0),(0,3)$

Vertical asymptotes: $x = -1$

Horizontal asymptotes: $y = 1$

Holes: $x = 1$

13. Intercepts: $\left(\frac{1}{2},0\right),(-1,0),\left(0,\frac{1}{4}\right)$

Vertical asymptotes: $x = -2, x = 2$

Horizontal asymptotes: $y = 2$

Holes: none

15. Intercepts: $\left(\dfrac{2}{3},0\right)$ $(-2,0)$

Vertical asymptotes: $x=0$, $x=4$

Horizontal asymptotes: $y=0$

17. Intercepts: $(1,0),(-3,0),(5,0),\left(0,-\dfrac{15}{16}\right)$

Vertical asymptotes: $x=-2,4$

Horizontal asymptotes: $y=1$

Holes: none

Functions will vary. Mainly looking for correct vertical asymptotes, horizontal asymptote, intercepts.

19. $y=\dfrac{50(x-2)(x+1)}{(x+5)(x-5)}$

21. $y=\dfrac{7(x-4)(x+6)}{(x+4)(x+5)}$

23. $y=\dfrac{(x-2)^2}{2(x+1)}$

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

27. $y=\dfrac{27(x-2)}{(x+3)(x-3)^2}$

29. $y=-\dfrac{(x-2)(x-4)}{(x-4)(x+1)}$