Assigned Problems – Vertical Asymptotes and End Behaviour

1. State the domain of each function, then determine the equation of any vertical asymptotes and/or coordinates of any holes in the graph of the function.
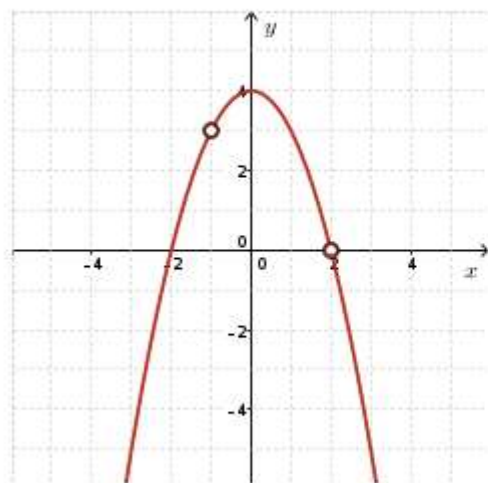
   a. $f(x) = \dfrac{2x}{x - 3}$

   b. $f(x) = \dfrac{2x^2 + x}{x^2 - 5x + 6}$

   c. $f(x) = \dfrac{3x^2 - 21x}{6x^2 - 39x - 21}$

   d. $f(x) = \dfrac{x^3 + x}{6x^3 + x^2 - x}$

   e. $f(x) = \dfrac{x^3 - x}{2x^3 + 9x^2 + 13x + 6}$

2. Determine an equation for the rational function shown in the graph below.

3. Identify the horizontal asymptote of each function. Determine if the graph of the function approaches this asymptote from above or below as $x \to \infty$, and as $x \to -\infty$.

   a. $f(x) = \dfrac{2x}{x - 2}$

   b. $g(x) = \dfrac{-x^2}{x^2 + 1}$

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

4. Determine the values of a, b and c for a function defined by $f(x) = \dfrac{ax - 2}{bx + c}$, with a vertical asymptote of $x = 4$, a horizontal asymptote of $y = -3$ and an x-intercept of $\frac{1}{3}$.

5. Based on your understanding of vertical asymptotes and holes, choose the most appropriate graph for each equation below. Support your choice.

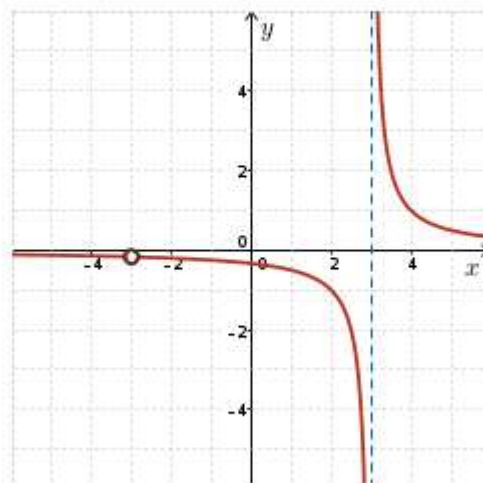a. $f(x) = \dfrac{x-3}{x^2-3x}$

b. $g(x) = \dfrac{x^2+3x}{x^2+9}$

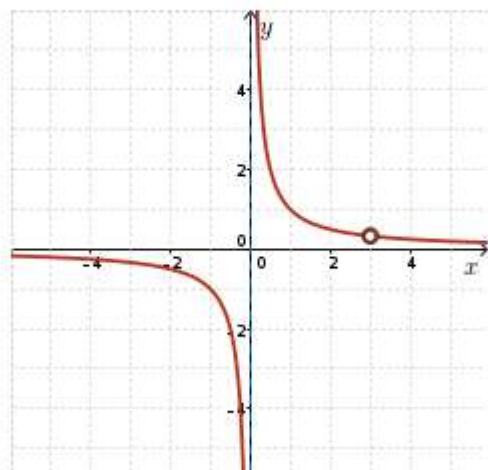c. $h(x) = \dfrac{-3}{x+3}$

d. $p(x) = \dfrac{3x}{x^2+3x}$

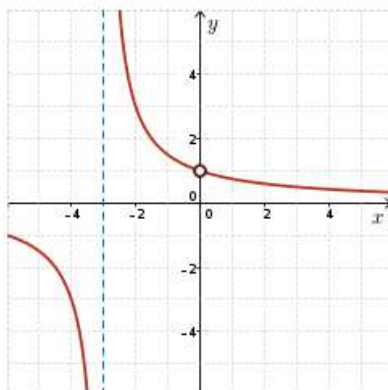e. $q(x) = \dfrac{x+3}{x^2-9}$

f. $r(x) = \dfrac{3x+9}{x^2+6x+9}$

I.

II.

III.

IV.

V.

VI.