Graphing Rational Functions

Rational Function:

an equation of the form $f(x) = \frac{p(x)}{q(x)}$ where $q(x) \neq 0$.

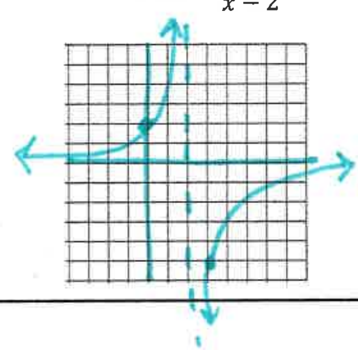
- The graphs of rational functions have breaks in continuity. These can appear in two different forms.
  - Asymptotes: If the rational expression of a function is written in simplest form and the function is undefined for x = a, then x = a is a vertical asymptote.
  - Point Discontinuity (Hole): If the original function is undefined for x = a but the rational expression in simplest form is defined for x = a, then there is a hole in the graph at x = a.
    - MEANING: If the same value makes both the numerator and denominator zero, there is a hole instead of an asymptote.

Graph the function. Write the asymptotes and/or holes in the graph.

$$f(x) = \frac{-4}{x-2}$$

$x-2=0$

$x \neq 2 \rightarrow$ asymptote



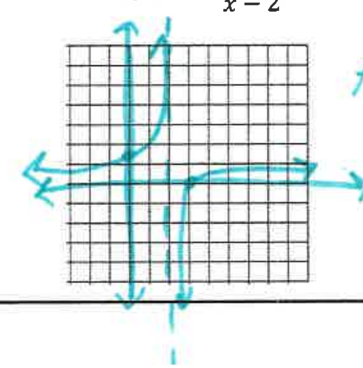
Graph the function. Write the asymptotes and/or holes in the graph.

$$f(x) = \frac{x-3}{x-2}$$

$x-2=0$

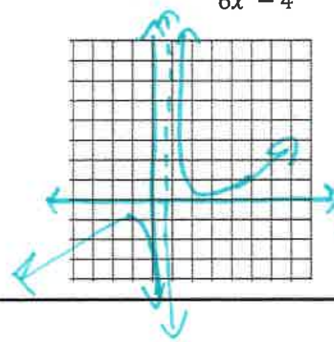
$x \neq 2$

Asymptote: $x=2$



Graph the function. Write the asymptotes and/or holes in the graph.

$$f(x) = \frac{2x^2 + 5}{6x - 4}$$



$6x - 4 \neq 0$

$6x \neq 4$

$x \neq \frac{4}{6}$

$x \neq 2/3$

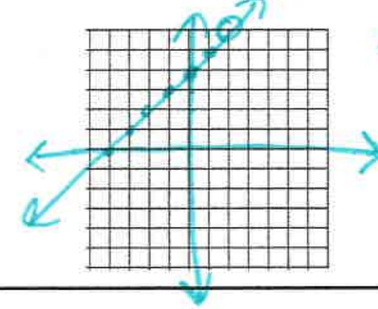
Asymptote:

$x = 2/3$

Graph the function. Write the asymptotes and/or holes in the graph.

$$f(x) = \frac{x^2 + 2x - 8}{x - 2} \rightarrow \text{Factor}$$

$$\frac{(x+4)\cancel{(x-2)}}{\cancel{(x-2)}}$$



hole $x = 2$