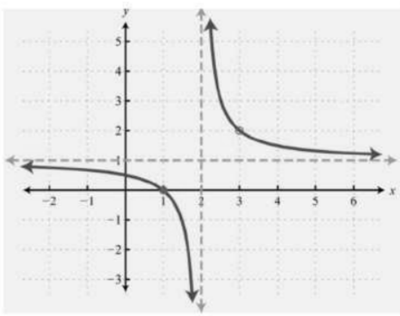
Evaluate the limit based on the graph of f shown.



$$\lim_{x \to \infty} f(x) = 1$$

$$\lim_{x \to -\infty} f(x) = 1$$

$$\lim_{x \to 2^-} f(x) = -\infty$$

$$\lim_{x \to 2^+} f(x) = \infty$$

Use limits to describe the behavior of the rational function near the indicated asymptote.

V.A. $x = -3$

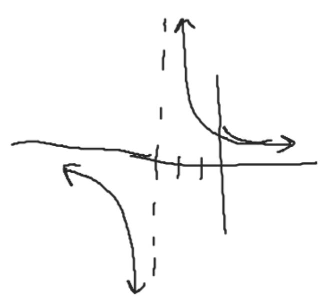
$f(-4) = \frac{6}{-4+3} = \frac{6}{-1}$

$$f(x) = \frac{6}{x+3}$$

$\lim_{x \to -3^-} f(x) = -\infty$

$f(-2) = \frac{6}{-2+3} = \frac{6}{1}$

$\lim_{x \to -3^+} f(x) = \infty$



Describe how the graph of the given function can be obtained by transforming the graph of the reciprocal/inverse function. Identify the horizontal and vertical asymptotes and use limits to describe the corresponding behavior. Sketch the graph of the function.

$$f(x) = \frac{3x - 5}{x + 2}$$

V.A. $x = -2$

H.A. $y = 3$

Reflection over x-axis

V.S. by factor of 11

up 3

Left 2

$$\begin{array}{r|rr} -2 & 3 & -5 \\ & & -6 \\ \hline & 3 & \boxed{-11} \end{array}$$

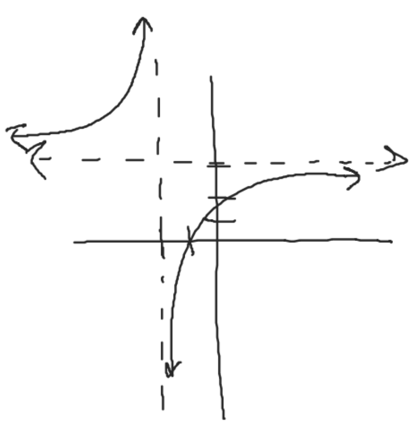
$\frac{1}{x}$

$3 + \frac{-11}{x+2}$

$\frac{11}{x}$

$-\frac{11}{x+2} + 3$

$11\left(\frac{1}{x}\right)$



$\lim_{x \to -2^-} = \infty$

$\lim_{x \to -2^+} = -\infty$

Solve the equation algebraically

$$(2x)x+\left(\frac{12}{x}\right)x=(11)x$$

$$2x^2+12=11x$$

$$2x^2-11x+12=0$$

$$(2x-3)(x-4)=0$$

$$x=\frac{3}{2} \qquad x=4$$

Solve the equation algebraically

$$\left(\frac{x+3}{\cancel{x}}\right)(\cancel{x})(x+3) - \left(\frac{2}{\cancel{x+3}}\right)(x)(\cancel{x+3}) = \left(\frac{6}{\cancel{x^2+3x}}\right)(\cancel{x})(\cancel{x+3})$$

$$(x+3)(x+3) - 2x = 6$$

$$x^2+6x+9-2x=6$$

$$x^2+4x+3=0$$

$$x^2+4x+3=0$$

$$(x+3)(x+1)=0$$

$\cancel{x=-3}$ $x=-1$

Solve the equation algebraically

$$\frac{2x}{x-1}+\frac{1}{x+3}=\frac{2}{\cancel{x^2+2x+3}}$$

$$x^2+2x-3$$

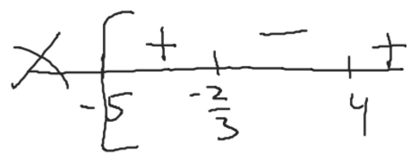
$$2x(x+3)+x-1=2$$

$$2x^2+6x+x-1=2$$

$$2x^2+7x-3=0$$

Determine the values of x that cause the function to be a) zero, b) undefined, c) Positive, and d) Negative

$$f(x) = \frac{\sqrt{x+5}}{(3x+2)(x-4)}$$



Zeros $x = -5$

Undefined $x = -\frac{2}{3}, 4$ $x < -5$

Pos $(-5, -\frac{2}{3}) \cup (4, \infty)$

Neg $(-\frac{2}{3}, 4)$

$f(-1) = \frac{+}{(-)(-)} = \frac{+}{+}$

$f(0) = \frac{+}{(+)(-)} = \frac{+}{-}$

$f(5) = \frac{+}{(+)(+)} = \frac{+}{+}$

Solve the inequality

$(x+2)(x-1)$

$$\frac{x^2 + x - 2}{x^2 + 6x + 8} < 0$$

$(x+4)(x+2)$

$(-4, -2) \cup (-2, 1)$

$+ \quad -4 \quad - \quad -2 \quad - \quad 1 \quad +$

$f(-5) = \frac{(-)(-)}{(-)(-)} = \frac{+}{+} = +$

$f(-3) = \frac{(-)(-)}{(+)(-)} = \frac{+}{-} = -$

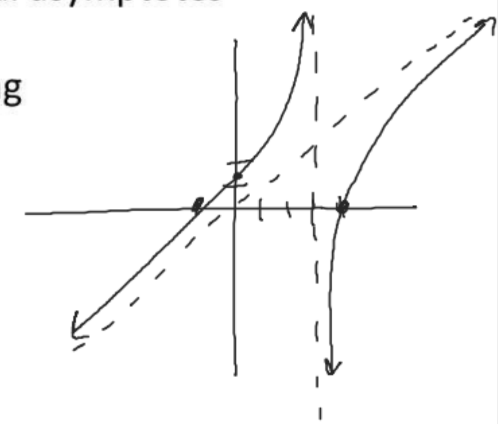
$f(0) = -\frac{2}{8} = -$

$f(2) = \frac{(+)(+)}{(+)(+)} = \frac{+}{+} = +$

$$f(x) = \frac{\overset{(x-4)(x+1)}{x^2 - 3x - 4}}{x - 3}$$

$$\begin{array}{c|ccc} 3 & 1 & -3 & -4 \\ & & 3 & 0 \\ \hline & 1 & 0 & \boxed{\cancel{-4}} \end{array}$$

A) Find the Intercepts x-intercepts $x = 4, -1$ y-intercept $(0, \frac{4}{3})$
B) Find the asymptotes (Vertical, Horizontal/Slant) V.A $x = 3$ H.A. None S.A. $y = x$
C) Find the Domain $(-\infty, 3) \cup (3, \infty)$
D) Determine where the function is continuous $(-\infty, 3) \cup (3, \infty)$
E) Use the limits to describe the end behaviors $\lim_{x \to \infty} f(x) = \infty$ $\lim_{x \to -\infty} f(x) = -\infty$
F) Use the limits describe the behaviors at the vertical asymptotes
G) Sketch a graph
H) Then find the intervals of increasing and decreasing



$$\frac{\overset{-}{(x-4)}\overset{+}{(x+1)}}{\underset{-}{x-3}}$$

$$\frac{(-)(+)}{+} \quad \frac{-}{+}$$

$\lim_{x \to 3^-} f(x) = \infty$

$\lim_{x \to 3^+} f(x) = -\infty$