Writing Rational Functions

The **zeros** (x-intercepts) of a rational function are where the numerator (after simplifying) equals zero.

Find the zeros of: f(x) = $\frac{x^2-2x+1}{x^2+8x-9}$

$$f(x) = \frac{(x-1)(x-1)}{(x+9)(x-1)}$$

Factor the numerator and denominator

$$f(x) = \frac{(x-1)\cancel{(x-1)}}{(x+9)\cancel{(x-1)}}$$

Cancel common factors

$$f(x) = \frac{(x-1)}{(x+9)}$$

Set the numerator equal to 0

x – 1 = 0   f(x) has a zero at x = 1

Find the zeros of: f(x) = $\frac{x^3+x^2-16x-16}{x^2-2x-3}$

f(x) = $\frac{(x^2-16)(x+1)}{(x-3)(x+1)}$

Factor the numerator and denominator

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

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

Cancel common factors

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

x + 4 = 0 and x – 4 = 0

Set the numerator equal to 0

f(x) has zeros at x = -4 and x = 4

Write the equation of a rational function that:

-has a hole at x = 4

-has a vertical asymptote at x = 2 and x = 0

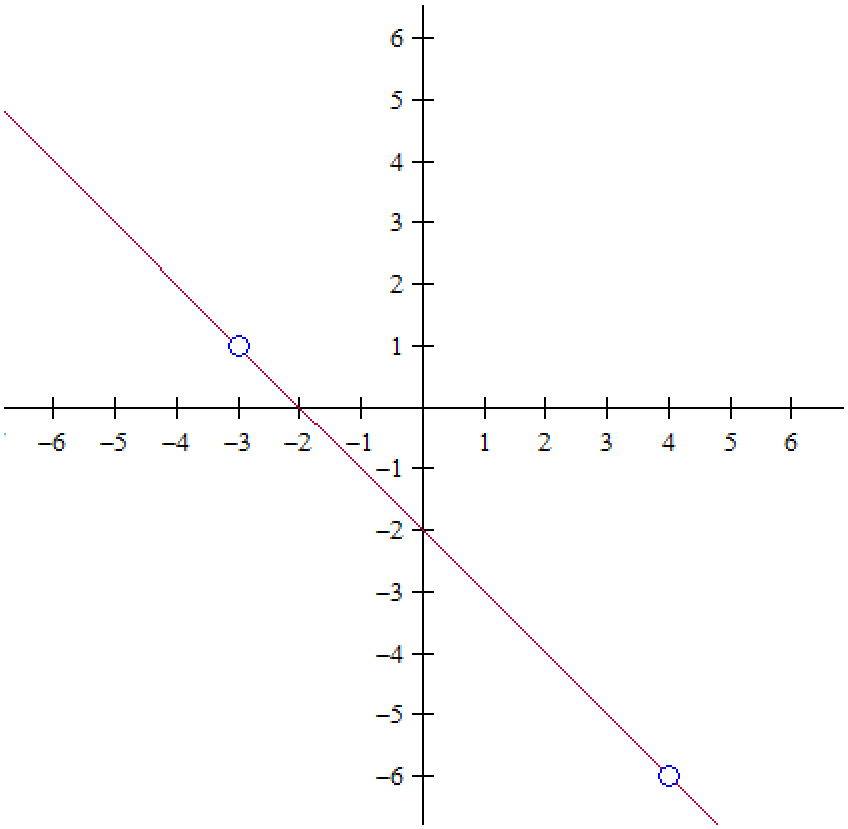
-has a zero at x = 3

-is positive

Hole at x = 4	VA at x = 2 and x = 0	Zero at x = 3
$\frac{(x-4)}{(x-4)}$	$\frac{1}{(x)(x-2)}$	$\frac{(x-3)}{1}$

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

Write an equation for the following graph:



Vertical Asymptote: none

Zero at x = -2 $\frac{(x+2)}{1}$

Holes at x = -3, x = 4

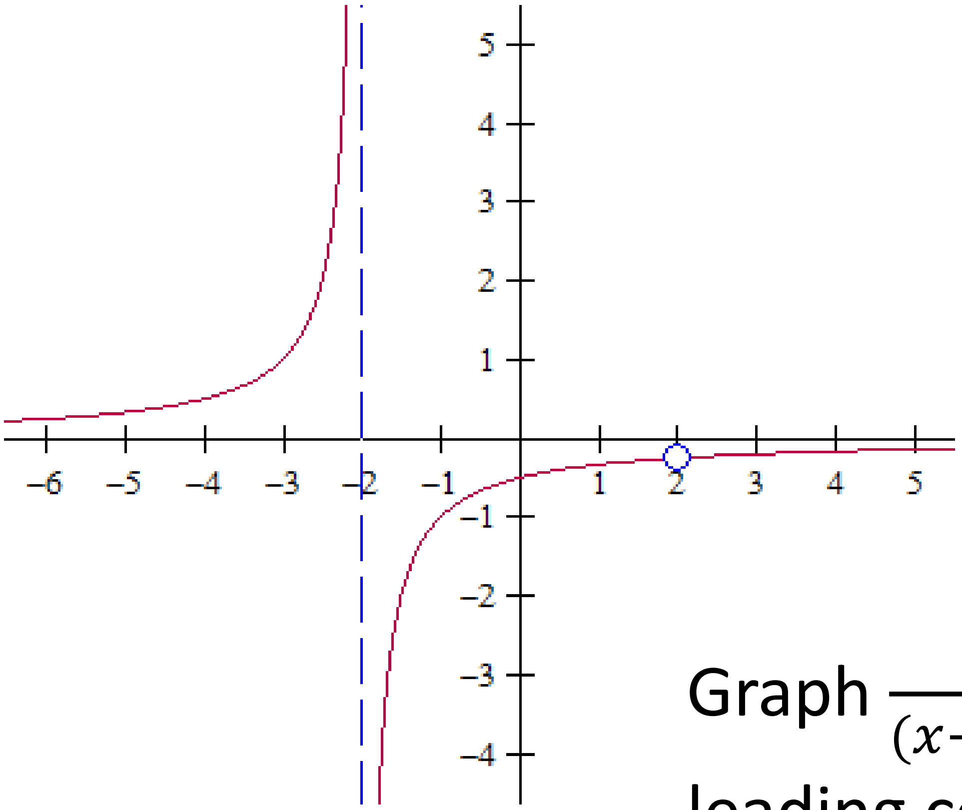
$$\frac{(x+3)(x-4)}{(x+3)(x-4)}$$

Slope of graph: -1/1

Equation:

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

Write the equation of the following graph:



VA at x = -2 $\quad \frac{1}{(x+2)}$

Zeros: none

Hole at x = 2 $\quad \frac{(x-2)}{(x-2)}$

Graph $\frac{(x-2)}{(x+1)(x-2)}$ to see that the leading coefficient should be negative.

$$g(x) = \frac{-(x-2)}{(x+2)(x-2)}$$