Graph of General Rational Functions:

If p(x) and q(x) have no common factors, then the following is true:

$$f(x) = \frac{p(x)}{q(x)} = \frac{a_m x^m + a_{m-1} x^{m-1} \ldots + a_1 x + a_0}{b_n x^n + b_{n-1} x^{n-1} \ldots + b_1 x + b_0}$$

← polynomial (numerator)
← polynomial (denominator)

1. The x-intercepts are the zeros of p(x)
2. The vertical asymptotes are at the zeros of q(x)
3. There is at *most* 1 horizontal asymptote. The horizontal asymptote is determined by the degrees *m* and *n*.

How to determine where a horizontal asymptote is:

$$f(x) = \frac{p(x)}{q(x)} = \frac{a_m x^m + a_{m-1} x^{m-1} \ldots + a_1 x + a_0}{b_n x^n + b_{n-1} x^{n-1} \ldots + b_1 x + b_0}$$

If $m < n$	The line y = 0 is a horizontal asymptote
If $m = n$	The line $y = \frac{a_m}{b_n}$ is a horizontal asymptote
If $m > n$	The graph has no horizontal asymptote

Determine where the horizontal and vertical asymptotes are and what the zeros of the function will be:

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

Determine where the horizontal and vertical asymptotes are and what the zeros of the function will be:

$$f(x) = \frac{x^3 - x^2 - 6x}{-3x^2 - 3x + 18}$$

Determine where the horizontal and vertical asymptotes are and what the zeros of the function will be:

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

$$f(x) = \frac{x - 4}{-4x - 16}$$

$$f(x) = \frac{x^2 + 2x}{-4x + 8}$$

Write an example of a rational function that would have a vertical asymptote at $x = -1$

Write an example of a rational function that would have a horizontal asymptote at $y = 0$

Write an example of a rational function that would have a horizontal asymptote at $y = 2$

Write an example of a rational function that would not have a horizontal asymptote.

Graph this function:

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

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Graph this function:

$$f(x) = \frac{3x^2 - 12x}{x^2 - 2x - 3}$$