

Precalculus Worksheet 4 - Rational Functions

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A *rational function* is a function of the form

$$f(x) = \frac{g(x)}{h(x)},$$

where $g(x)$ and $h(x)$ are polynomials. A rational function is in *lowest form* if the numerator and the denominator have no common zeros. Assume that $f(x) = g(x)/h(x)$ is a rational function in lowest form.

The *degree* of $f(x)$ is $\max\{\deg(g), \deg(h)\}$.

The *zeros* of $f(x)$ are the zeros of $g(x)$; that is, they are the solutions to $g(x) = 0$.

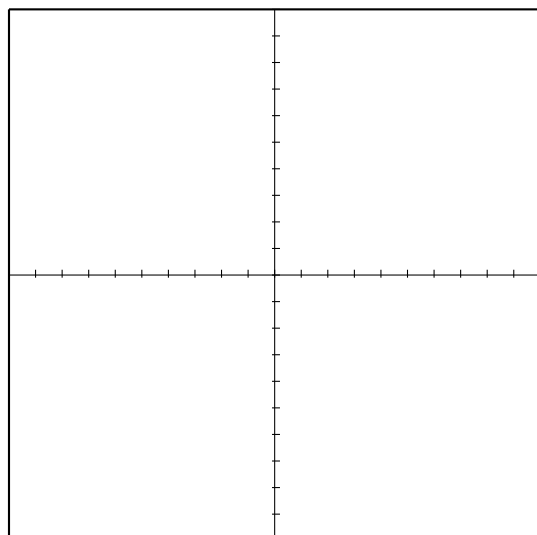
The *poles* of $f(x)$ are the zeros of $h(x)$; that is, they are the solutions to $h(x) = 0$.

The *y-intercept* of $f(x)$ is the point $(0, f(0))$.

The *x-intercepts* of $f(x)$ are the points $(z, 0)$, where z is a *real* zero of $f(x)$.

The *vertical asymptotes* of $f(x)$ are the lines $x = p$, where p is a *real* pole of $f(x)$.

The *polynomial asymptote* of $f(x)$ is the polynomial equation $y = q(x)$, where $q(x)$ is the quotient when $g(x)$ is divided by $h(x)$ using polynomial division.



Equation:

$$y = \frac{6}{x - 2}$$

Degree:

Zeros:

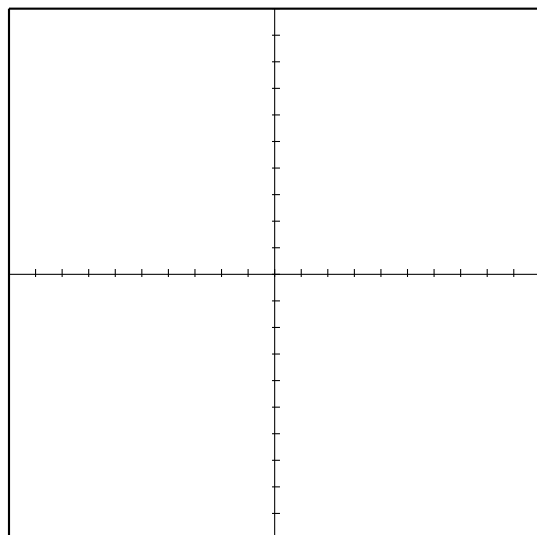
Poles:

y-intercept:

x-intercepts:

Vertical Asymptotes:

Polynomial Asymptote:



Equation:

$$y = \frac{4x + 2}{3x - 6}$$

Degree:

Zeros:

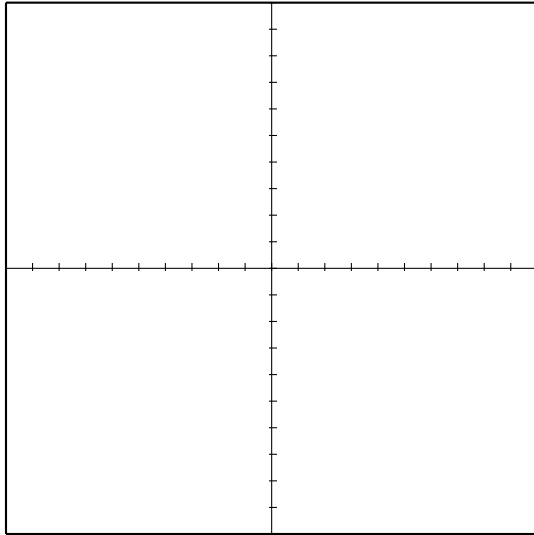
Poles:

y-intercept:

x-intercepts:

Vertical Asymptotes:

Polynomial Asymptote:



Equation:

$$y = \frac{x - 5}{x^2 + x - 6}$$

Degree:

Zeros:

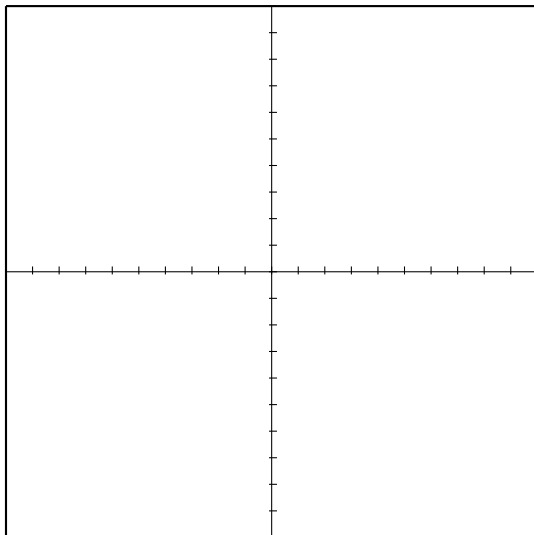
Poles:

***y*-intercept:**

***x*-intercepts:**

Vertical Asymptotes:

Polynomial Asymptote:



Equation:

$$y = \frac{x^2 - x - 2}{x + 2}$$

Degree:

Zeros:

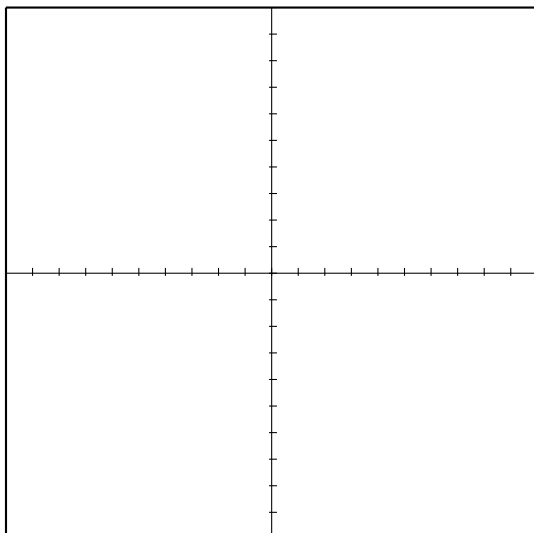
Poles:

***y*-intercept:**

***x*-intercepts:**

Vertical Asymptotes:

Polynomial Asymptote:



Equation:

$$y = \frac{x^2 - 49}{x^2 - 25}$$

Degree:

Zeros:

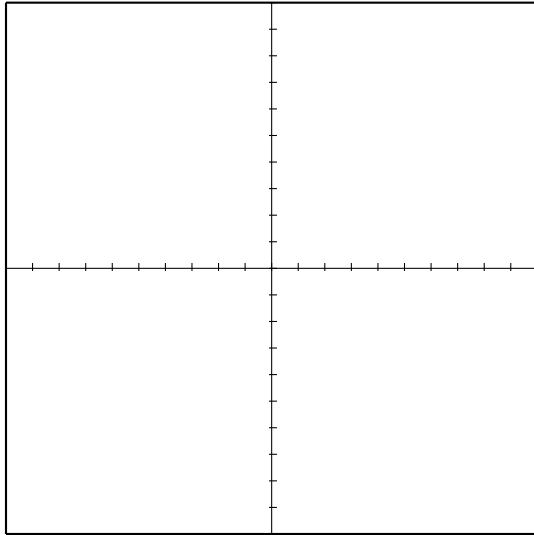
Poles:

***y*-intercept:**

***x*-intercepts:**

Vertical Asymptotes:

Polynomial Asymptote:



Equation:

$$y = \frac{x^3 - x}{x^2 - 9}$$

Degree:

Zeros:

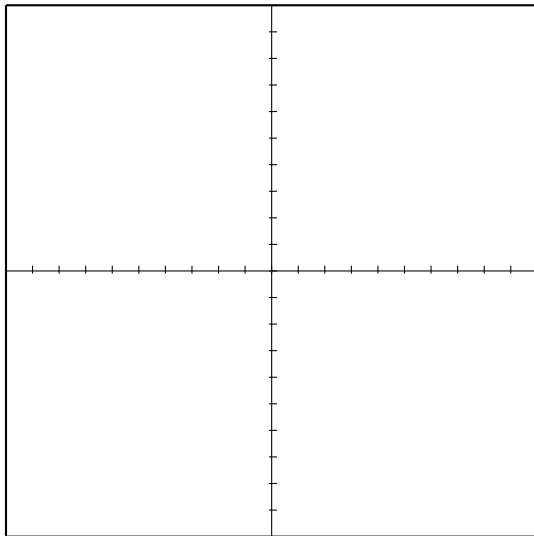
Poles:

***y*-intercept:**

***x*-intercepts:**

Vertical Asymptotes:

Polynomial Asymptote:



Equation:

$$y = \frac{x^2 - 25}{x^3 - 3x^2 - 4x + 12}$$

Degree:

Zeros:

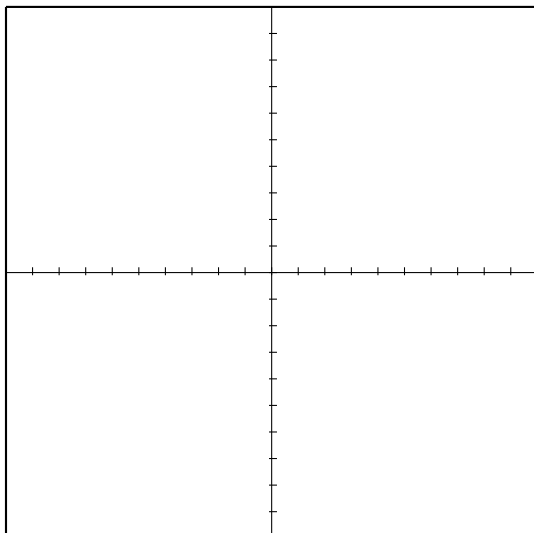
Poles:

***y*-intercept:**

***x*-intercepts:**

Vertical Asymptotes:

Polynomial Asymptote:



Equation:

$$y = \frac{x^3 - 6x + 7}{x + 1}$$

Degree:

Zeros:

Poles:

***y*-intercept:**

***x*-intercepts:**

Vertical Asymptotes:

Polynomial Asymptote: