

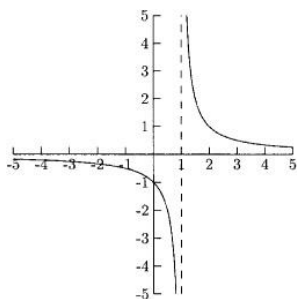
Precalculus Unit 3: 3.1 Notes

Rational Functions and Asymptotes

Rational Function: f is a rational function if it is of the form $f(x) = \frac{p(x)}{q(x)}$ where $p(x)$ and $q(x)$ are polynomials and q is not the zero polynomial.

Domain: The domain of a rational function will be all real numbers except for the values that make $q(x) = 0$. The denominator cannot equal zero because division by zero is undefined.

Vertical Asymptotes: The line $x = a$ is a vertical asymptote if $f(x) \rightarrow \infty$ or $f(x) \rightarrow -\infty$ as $x \rightarrow a^-$ or $x \rightarrow a^+$.



*A graph will never cross a vertical asymptote.

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

Factored:

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

Factored:

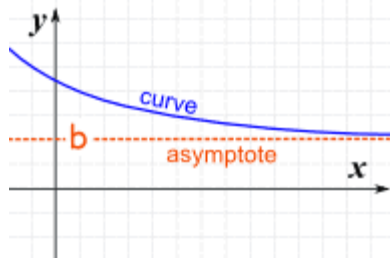
$$f(x) = \frac{3x^2 - x - 2}{4x - 4}$$

Factored:

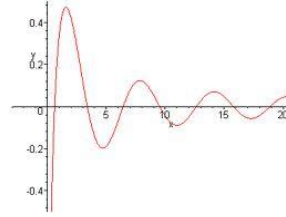
$$f(x) = \frac{2x^2 + 5x - 3}{3x^3 + 11x^2 + 6x}$$

Factored:

Horizontal Asymptote: The line $y=b$ is a horizontal asymptote if $f(x) \rightarrow b$ as $x \rightarrow \infty$ or $x \rightarrow -\infty$



* A graph can cross a horizontal asymptote.



Type 1:

Type 2:

Type 3:

