

## Rational Functions

Rational functions are of the form

$$f(x) = \frac{p(x)}{q(x)}$$

where  $p(x)$  and  $q(x)$  are polynomial functions and  $q(x) \neq 0$ . The following are all examples of rational functions:

$$f(x) = \frac{1}{x}$$

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

$$f(x) = \frac{ax + b}{cx + d}$$

Since  $q(x) \neq 0$ , the domain of a rational function is often limited. For example, the following rational function has the set of all real numbers except  $x = 1$  and  $x = -1$ .

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

Note that  $q(x) = 1$  is a perfectly valid function. That means that all polynomial functions (including constant, linear, quadratic and cubic functions) are rational functions.