

Reducing Rational Expressions

A **rational expression** is written in the form $\frac{P}{Q}$, where both P and Q are polynomials, and Q does not equal zero. A rational expression is **undefined** for values that make the denominator 0.

To find the values that make a rational expression undefined, you set the denominator equal to zero and solve.

$$\frac{x}{x-3} \quad \frac{x^2+2}{x^2-3x+2}$$

$$x-3=0 \quad x^2-3x+2$$

$$x \neq 3 \quad (x-2)(x-1)=0$$

$$x-2=0 \quad x-1=0$$

$$x \neq 2 \quad x \neq 1$$

When simplifying rational expressions, they will need to be in factored form. Being in factored form will allow you to cancel **like** binomials.

$$\frac{x^2-9}{x^2+x-6} = \frac{(x-3)\cancel{(x+3)}}{\cancel{(x+3)}(x-2)} = \frac{x-3}{x-2}$$

$$\frac{x^3+7x^2}{x^2+5x-14} = \frac{x^2\cancel{(x+7)}}{\cancel{(x+7)}(x-2)} = \frac{x^2}{x-2}$$

$$\frac{49-y^2}{y-7} = \frac{(7-y)(7+y)}{y-7} = \frac{-\cancel{(y-7)}(7+y)}{\cancel{y-7}} = -(7+y)$$

$$\frac{5x^2-500}{35x+350} = \frac{5(x^2-100)}{35(x+10)} = \frac{\cancel{5}(x-10)\cancel{(x+10)}}{\cancel{35}^7(x+10)} = \frac{x-10}{7}$$