

October 29

Multiply Rational Expressions

Ex 1 Simplify: $\frac{x^2}{x+9} \cdot \frac{x^2+15x+54}{x^2-4x} = \frac{x \cancel{x^2}}{\cancel{x+9}} \cdot \frac{\cancel{x}(x+9)(x+6)}{\cancel{x}(x-4)}$

Step 1: Factor!!

x^2
does not factor

$x+9$
does not factor

$$\begin{aligned} x^2 + 15x + 54 \\ x^2 \cdot 54 = 54x^2 \\ \quad \quad \quad \wedge \\ \quad \quad \quad 9x + 6x = 15x \end{aligned}$$

$$\begin{aligned} \frac{x^2 - 4x}{x} \quad \text{GCF: } x \\ \frac{x(x-4)}{x} \end{aligned}$$

$$\begin{array}{r|l} \frac{x^2+9x}{x} + \frac{6x+54}{6} & \\ \hline x(x+9) & 6(x+9) \\ \hline & (x+9)(x+6) \end{array}$$

Step 2: Cancel (It does not matter which fraction the factor is in. You just need one from the top and one from the bottom.)

Step 3: Write what is left.

$$\boxed{\frac{x(x+6)}{x-4}}$$

Ex2 Simplify: $\frac{5x+15}{x^2-9} \cdot \frac{8x+24}{4} = \frac{5(x+3)}{(x+3)(x-3)} \cdot \frac{2 \cdot \cancel{8}(x+3)}{\cancel{4}}$

$\frac{5x+15}{5} \text{ GCF: } 5$
 $\frac{5(x+3)}{5}$

x^2-9
 $\sqrt{x^2}=x \quad \sqrt{9}=3$
 $(x+3)(x-3)$

$\frac{8x+24}{8} \text{ GCF: } 8$
 $\frac{8(x+3)}{8}$

4
 does not factor

$$\frac{5 \cdot 2(x+3)}{x-3} = \frac{10(x+3)}{x-3}$$

Divide Rational Expressions

Ex3 Simplify: $\frac{2x^2+7x-15}{x^2-25} \div \frac{x^2-7x+12}{x-4}$ Flip
 Keep change

Change to multiplying by the reciprocal.

$$\frac{2x^2+7x-15}{x^2-25} \cdot \frac{x-4}{x^2-7x+12} = \frac{(2x-3)(x+5)}{(x+5)(x-5)} \cdot \frac{(x-4)}{(x-3)(x-4)}$$

$2x^2+7x-15$
 $2x^2 \cdot -15 = -30x^2$
 $-3x + 10x = 7x$

x^2-25
 $\sqrt{x^2}=x \quad \sqrt{25}=5$
 $(x+5)(x-5)$

$x-4$
 does not factor

$x^2-7x+12$
 $x^2 \cdot 12 = 12x^2$
 $-3x + -4x = -7x$

$$\begin{array}{r|l} 2x^2-3x+10x-15 & \\ \hline x & x \quad 5 \quad 5 \\ \hline x(2x-3) & 5(2x-3) \\ \hline & (2x-3)(x+5) \end{array}$$

$$\begin{array}{r|l} x^2-3x-4x+12 & \\ \hline x & x \quad -4 \quad -4 \\ \hline x(x-3) & -4(x-3) \\ \hline & (x-3)(x-4) \end{array}$$

$$\frac{2x-3}{(x-5)(x-3)}$$