

March 4

Multiply Rational Expressions

Ex1) Simplify: $\frac{x^2}{x+9} \cdot \frac{x^2+15x+54}{x^2-4x} = \frac{\cancel{x^2}x}{\cancel{x+9}} \cdot \frac{(x+6)\cancel{(x+9)}}{\cancel{x}(x-4)}$

Step 1: Factor!

$\frac{x^2}{x+9}$
DNF

$\frac{x+9}{x+9}$
DNF

$x^2+15x+54$
 $x^2 \cdot 54 = 54x^2$
 \wedge
 $10x + 9x = 15x$

$\frac{x^2-4x}{x} \cdot \frac{x}{x}$ GCF: x
 $x(x-4)$

$\frac{x^2+6x}{x} \mid \frac{9x+54}{9}$
 $x(x+6) \mid 9(x+6)$
 $(x+6)(x+9)$

Step 2: Cancel.

Step 3: Write what is left.

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

Ex2) Simplify: $\frac{5x+15}{x^2-9} \cdot \frac{6x+18}{4} = \frac{\cancel{5}(x+3)}{\cancel{(x+3)}(x-3)} \cdot \frac{3\cancel{6}(x+3)}{2\cancel{4}}$

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

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

$\frac{6x+18}{6} \cdot \frac{6}{6}$ GCF: 6
 $6(x+3)$
 $\frac{4}{4}$ DNF

$$\frac{5 \cdot 3 \cdot (x+3)}{(x-3) \cdot 2} = \frac{15(x+3)}{2(x-3)}$$

Divide Rational Expressions

Ex 3 Simplify: $\frac{2x^2+7x-15}{x^2-25} \div \frac{x^2-7x+12}{x-4}$ Flip

Keep change

change to multiplication by the reciprocal.

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

$$\begin{array}{l} (2x^2+7x-15) \\ 2x^2 \cdot -15 = -30x^2 \\ \quad \quad \quad \wedge \\ \quad \quad 10x + -3x = 7x \end{array}$$

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

$$\begin{array}{l} (x^2-7x+12) \\ x^2 \cdot 12 = 12x^2 \\ \quad \quad \quad \wedge \\ \quad -4x + -3x = -7x \end{array}$$

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

$$\frac{x-4}{DNF}$$

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

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