

Simplify Rational Expressions

(Ex1) Simplify: $\frac{2x-8}{x^2-6x+8} = \frac{2(x-4)}{(x-4)(x-2)} = \boxed{\frac{2}{x-2}}$

Step 1: FACTOR !!

$$\frac{2x-8}{2} \quad \text{GCF: } 2$$

$$2(x-4)$$

$$x^2 - 6x + 8$$

$$x^2 \cdot 8 = 8x^2$$

$$\quad \wedge$$

$$-4x + -2x = -6x$$

$$\begin{array}{r|l} x^2 - 4x & 2x + 8 \\ x & -2 & -2 \end{array}$$

$$x(x-4) \quad | \quad 2(x-4)$$

$$(x-4)(x-2)$$

Step 2: Cancel.

Step 3: Write what is left.

(Ex2) Simplify: $\frac{x^2+3x-28}{x^2-49} = \frac{(x-4)(x+7)}{(x+7)(x-7)} = \boxed{\frac{x-4}{x-7}}$

$$x^2 + 3x - 28$$

$$x^2 \cdot -28 = -28x^2$$

$$\quad \wedge$$

$$-4x + 7x = 3x$$

$$x^2 - 49$$

$$\sqrt{x^2} = x \quad \sqrt{49} = 7$$

$$(x+7)(x-7)$$

$$\begin{array}{r|l} x^2 - 4x & 7x - 28 \\ x & 7 & 7 \end{array}$$

$$x(x-4) \quad | \quad 7(x-4)$$

$$(x-4)(x+7)$$

Ex 3 Simplify: $\frac{x^2-1}{x-1} = \frac{(x+1)\cancel{(x-1)}}{\cancel{(x-1)}} = \frac{x+1}{1} = \boxed{x+1}$

x^2-1
 $\sqrt{x^2} = x \quad \sqrt{1} = 1$
 $(x+1)(x-1)$

$x-1$
 does not factor
 DNF

Ex 4 Simplify: $\frac{9x^2+81x}{3x^4+24x^3-27x^2} = \frac{\cancel{9x}(x+9)}{\cancel{3x^2} \cancel{x} (x-1)\cancel{(x+9)}} = \frac{3}{x(x-1)}$

$\frac{9x^2+81x}{9x}$
 $9x(x+9)$

GCF:

$\frac{3x^4}{3x^2} + \frac{24x^3}{3x^2} - \frac{27x^2}{3x^2}$ GCF: $3x^2$

$3x^2(x^2+8x-9)$

$x^2-9 = -9x^2$

$-1x + 9x = 8x$

$\frac{x^2}{x} - \frac{1x}{x} + \frac{9x}{9} - \frac{9}{9}$

$x(x-1) \quad | \quad 9(x-1)$

$3x^2(x-1)(x+9)$