Lesson 4.1: Rational Functions and their Operations

Remember...

$$\frac{42}{77} = \frac{\cancel{7}(6)}{\cancel{7}(11)} = \frac{6}{11}$$

Simplify. State excluded values.

$$\frac{3x+6}{9x^2-36} = \frac{3(x+2)}{9(x^2-4)} = \frac{3\cancel{(x+2)}}{9(x-2)\cancel{(x+2)}}$$

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

$\boxed{x \neq 2}$ $\boxed{x \neq -2}$

Simplify. State excluded values.

$$\frac{2x^3 + 7x^2 + 6x}{4x^3 - 9x} = \frac{x(2x^2 + 7x + 6)}{x(4x^2 - 9)} = \frac{x\cancel{(2x+3)}(x+2)}{x(2x-3)\cancel{(2x+3)}}$$

$$\boxed{\frac{x+2}{2x-3}}$$

$$\boxed{\begin{array}{l} x \neq 0 \\ x \neq \pm 3/2 \end{array}}$$

Remember...

$$\frac{1}{2} \times \frac{8}{5} = \frac{8}{10} = \boxed{\frac{4}{5}}$$

$$\frac{1}{3} \div \frac{7}{9} = \frac{1}{3} \cdot \frac{9}{7} = \frac{9}{21} = \boxed{\frac{3}{7}}$$

Simplify $\frac{x^2-4}{x^2-1} \cdot \frac{6x-6}{2x+4}$

$$\frac{\cancel{(x+2)}(x-2)}{(x+1)\cancel{(x-1)}} \cdot \frac{6\cancel{(x-1)}}{2\cancel{(x+2)}}$$

$$= \boxed{\frac{3(x-2)}{x+1}}$$

Simplify $\frac{2x^2+7x+6}{x^2-x} \cdot \frac{4x^2}{4x^2-9}$

$$\frac{\cancel{(2x+3)}(x+2)}{x(x-1)} \cdot \frac{4x^2}{\cancel{(2x+3)}(2x-3)}$$

$$\boxed{\frac{4x(x+2)}{(x-1)(2x-3)}}$$

Simplify $\frac{18x+9}{6x^2+3x} \div \frac{10}{5x^3}$

$$\frac{18x+9}{6x^2+3x} \cdot \frac{5x^3}{10}$$

$$\frac{\cancel{9}^{3}\cancel{(2x+1)}}{\cancel{3}_{1}x\cancel{(2x+1)}} \cdot \frac{5x^3}{10} = \frac{3}{\cancel{x}} \cdot \frac{\cancel{5}_{1}x^{\cancel{3}\,2}}{\cancel{10}_{2}}$$

$$= \boxed{\frac{3x^2}{2}}$$

Remember...

$$\frac{7}{6} - \frac{5}{6} = \frac{2}{6} = \boxed{\frac{1}{3}}$$

simplify

$$\frac{4}{4} \cdot \frac{1}{3} + \frac{1}{4} \cdot \frac{3}{3} = \frac{4}{12} + \frac{3}{12} = \boxed{\frac{7}{12}}$$

LCD: 12

$$\frac{2x}{x^2-1}+\frac{-x+1}{x^2-1} = \frac{x+1}{x^2-1} = \frac{\cancel{x+1}}{\cancel{(x+1)}(x-1)}$$

$$= \boxed{\frac{1}{x-1}}$$

$$\frac{(x-3)\,2x}{(x-3)(x+3)} - \frac{x+1}{x^2-9}$$

$$(x+3)(x-3)$$

LCD: $(x+3)(x-3)$

or

x^2-9

$$\frac{2x^2-6x}{(x-3)(x+3)} - \frac{x+1}{(x-3)(x+3)}$$

$$\boxed{\frac{2x^2-7x-1}{(x-3)(x+3)}}$$

$$\frac{(x+4)\,2}{(x+4)(x-2)} - \frac{x\,(x-2)}{(x+4)(x-2)}$$

$$\frac{2x+8}{(x+4)(x-2)} - \frac{x^2-2x}{(x+4)(x-2)}$$

$$\boxed{\frac{-x^2+4x+8}{(x+4)(x-2)}}$$

$$\frac{(x-4)}{(x-4)}\cdot\frac{2}{x-2} + \frac{x}{x^2-6x+8}$$

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

$$\frac{2x-8}{(x-4)(x-2)} + \frac{x}{(x-2)(x-4)}$$

$$\boxed{\frac{3x-8}{(x-4)(x-2)}}$$

$$\frac{(x+1)\,3}{(x+1)\,\underbrace{x^2-x}_{x(x-1)}} - \frac{4}{\underbrace{x^2-1}_{(x-1)(x+1)}}\;\begin{matrix} x \\ x \end{matrix}$$