

RATIONAL FUNCTIONS

Fractions with variables in the denom.

SIMPLIFY. - expression usually with variables.

Multiplication/Division

$$\frac{\cancel{14}^2}{\cancel{5}} \cdot \frac{\cancel{24}^8}{\cancel{5}} = \frac{16}{25}$$

$$\frac{x^2 - 16}{x^3 + 64} \cdot \frac{x^3 - 4x^2 + 16x}{4 - x}$$

$$\frac{\cancel{(x+4)}\cancel{(x-4)}}{\cancel{(x+4)}\cancel{(x^2+x+16)}} \cdot \frac{x\cancel{(x^2-4x+16)}}{\cancel{(x-4)}} = \frac{x}{-1} = -x$$

Factoring

2 terms

$$a^2 - b^2 = (a-b)(a+b)$$

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

$$x^2 - 81 = (x+9)(x-9)$$

$$a^2 + b^2 = \text{not factorable}$$

$$x^2 + 49 = x^2 + 49$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$x^3 - 8 = (x-2)(x^2 + 2x + 4)$$

$$x^3 + 125 = (x+5)(x^2 - 5x + 25)$$

3 terms - UnFOIL

$$x^2 + 5x - 14$$

$$(x+7)(x-2)$$

4 terms - Grouping

$$(x^3 - 3x^2) + (2x - 6)$$

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

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

$$\frac{\frac{2}{9}}{\frac{8}{3}} = \frac{2}{9} \cdot \frac{3}{8} = \frac{1}{12}$$

$$\frac{4y^2 - 9}{y^2 + 6y + 9} \div \frac{8y - 12}{2y^2 + 5y - 3}$$

$$\frac{4y^2 - 9}{y^2 + 6y + 9} \cdot \frac{2y^2 + 5y - 3}{8y - 12}$$

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

$$= \frac{(2y+3)(2y-1)}{4(y+3)}$$

ADDITION/SUBTRACTION

$$\frac{5}{5} \cdot \frac{3}{4} + \frac{7}{10} \cdot \frac{2}{2} = \frac{15}{20} + \frac{14}{20} = \frac{29}{20}$$

$\begin{array}{c} \wedge \quad \wedge \\ 2 \quad 2 \quad 5 \end{array}$
 $2 \cdot 2 \cdot 5$

$$\frac{\quad}{x^2 y} + \frac{\quad}{x y^3} = \frac{\quad}{x^2 y^3}$$

$$\frac{3y+1}{2y-10} - \frac{y+4}{y^2-2y-15}$$

$2(y-5) \quad (y-5)(y+3)$

$$\frac{(y+3)(3y+1)}{(y+3)2(y-5)} - \frac{y+4}{(y-5)(y+3)} \cdot (2)$$

$$\frac{3y^2 + y + 3y + 3}{2(y-5)(y+3)} + \frac{-2y + 8}{2(y-5)(y+3)}$$

$$\frac{3y^2 + 8y - 5}{2(y-5)(y+3)}$$

$$\frac{(3y-5)(y+1)}{2(y-5)(y+3)}$$

1) Factor the denominators!

$$-\frac{1}{2} \quad -\frac{1}{2} \quad -\frac{1}{2}$$

$$\frac{2x+1}{x^2+6x+9} + \frac{-x+2}{9-x^2}$$

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

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

$$= \frac{x^2 - 10x - 9}{(x+3)(x+3)(x-3)} \quad \cancel{(x-3)(x-3)}$$

1) Factor the denominators

2) Determine the common denom

3) Make each fraction have the common denom.

4) Add the numerators

5) Check to factor + reduce