February 10, 2025

RATIONAL FUNCTIONS - Operations with fractions

Simplify = small expressions with variables or a constant.

Multiplication/Division

$$\frac{2\cancel{4}}{\cancel{15}_{5}} \cdot \frac{\overset{8}{\cancel{24}}}{\cancel{35}_{5}} = \frac{16}{25}$$

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

$x^3 + 64$: 4^3

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

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

Factoring

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

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

$x^2 + 25$ = not poss.

$a^2 + b^2$ = not poss.

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

square, sq.

$x^3 + 343 = (x+7)(x^2-7x+49)$

7^3

4 terms - GROUPING

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

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

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

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

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

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

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

Addition/Subtraction

Common Denominators

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

$\frac{5}{5} \cdot \frac{2}{2}$

$4 = 2 \cdot 2$, $10 = 2 \cdot 5$, LCD $= 2 \cdot 2 \cdot 5$

$\frac{2}{a^2b^3} + \frac{4}{ab^2} = \frac{\quad}{a^2b^3}$

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

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

1) Factor Denominators
2) Make common denoms.
3) Combine fractions
4) Check to see if num/denom can factor + cancel

$\frac{3y^2+9y+y+3}{2(y-5)(y+3)} + \frac{-2y+8}{2(y-5)(y+3)}$

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

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

$$\frac{2x+1}{x^2+6x+9} + \frac{x+2}{9-x^2} \qquad \text{Factor Denominators!}$$

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

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

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

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

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