

# Math 112

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Ch 4 Rationals =  $\frac{\text{Polynomials}}{\text{Polynomials}}$

Domain: All Reals except denominator  $\neq 0$ .

Review  
Fractions

$$\frac{2}{3} \cdot \frac{7}{6} = \frac{2 \cdot 7}{3 \cdot 6} = \frac{2 \cdot 7}{3 \cdot 2 \cdot 3} = \frac{7}{9}$$

$$\frac{2}{3} \div \frac{12}{15} = \frac{2}{3} \cdot \frac{15}{12} = \frac{5}{6}$$

$$\frac{\frac{2}{3}}{\frac{12}{15}} = \frac{2}{3} \cdot \frac{15}{12}$$

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$$\begin{aligned} \frac{2}{3} + \frac{7}{15} &= \frac{2 \cdot 5}{3 \cdot 5} + \frac{7}{3 \cdot 5} = \frac{10}{15} + \frac{7}{15} = \boxed{10\left(\frac{1}{15}\right) + 7\left(\frac{1}{15}\right)} \\ &= \frac{10+7}{15} = \boxed{\frac{17}{15}} \end{aligned}$$

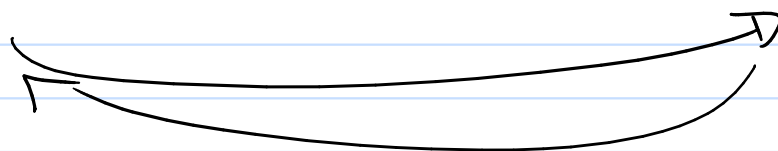
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$$\frac{2}{2x} + \frac{3}{2x} = \frac{2}{2x} + \frac{3x}{2x} = \boxed{\frac{2+3x}{2x}}$$

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$$\frac{a}{b} - \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{d} - \frac{b}{b} \cdot \frac{c}{d} = \frac{ad - bc}{bd}$$

$$\frac{a}{b} + \frac{c}{d} = \frac{a}{b} \frac{d}{d} + \frac{b}{b} \frac{c}{d} = \frac{ad + bc}{bd}$$



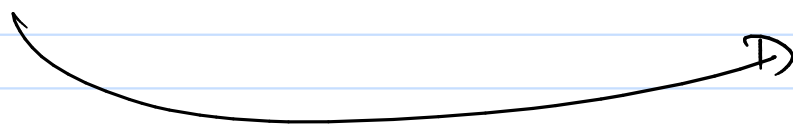
breaking across the common denom.

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

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



example Problems

①  $\frac{x^3 - 2x^2 + 1}{x^2 + 25}$

③  $\frac{2x^{100} - 1}{x - 1}$

②  $\frac{x + 3}{x - 2}$

Multiplikation:

$$\frac{6}{8} \cdot \frac{12}{18} = \frac{6 \cdot 12}{8 \cdot 18} = \frac{\cancel{2} \cdot \cancel{3} \cdot 4 \cdot \cancel{3} \cdot 1}{\cancel{2} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{6} \cdot 2} = \boxed{\frac{1}{2}}$$

$$1. \frac{\cancel{x} \cdot \cancel{3}}{\cancel{x} \cdot \cancel{x}} \cdot \frac{\cancel{x} \cdot \cancel{x} \cdot \cancel{3}}{\cancel{2} \cdot \cancel{3} \cdot \cancel{3}} = \frac{1}{2}$$

$$\frac{x^2-4}{x+3} \cdot \frac{x^2-9}{x^2-x-6} = \left[ \frac{\cancel{(x+2)}(x-2)}{\cancel{(x+3)}} \cdot \frac{\cancel{(x-3)}(x+3)}{\cancel{(x-3)}(x+2)} \right]$$

↑

$$= \left[ \begin{array}{l} x-2, \quad x \neq -3 \\ \quad \quad \quad x \neq -2 \\ \quad \quad \quad x \neq 3 \end{array} \right]$$

$$\frac{x+2}{x-3} \div \frac{1}{x^2-9} = \frac{x+2}{x-3} \cdot \frac{x^2-9}{1}$$

$$\frac{\frac{x+2}{\cancel{x-3}}}{\left(\frac{1}{x^2-9}\right)}$$

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

$$= \left[ (x+2)(x+3), \quad \begin{array}{l} x \neq 3 \\ x \neq -3 \end{array} \right]$$

$$= \left[ \begin{array}{l} x^2 + 5x + 6, \quad x \neq 3 \\ \quad \quad \quad \quad \quad \quad x \neq -3 \end{array} \right]$$

$$\frac{1}{2} - \frac{1}{2 \cdot 2} + \frac{1}{3}$$

$$\frac{1}{2} \frac{2 \cdot 3}{2 \cdot 3} - \frac{1}{2 \cdot 2} \frac{3}{3} + \frac{2 \cdot 2}{2 \cdot 2} \frac{1}{3}$$

$$\frac{6 - 3 + 4}{12} = \frac{7}{12}$$

$$\frac{x}{x+2} - \frac{x+1}{x^2-4} + \frac{1}{x+3}$$

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

Factor of denominator  $(x+2)(x-2)(x+3)$

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

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

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

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

$$= \frac{x^3 + x^2 - 10x - 7}{(x+2)(x-2)(x+3)}$$

