

Series: Mathematics - from zero to engineer (23).

Algebraic fractions.

- addition and subtraction

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

$$\frac{a}{b} - \frac{c}{d^2} + \frac{d}{a} = \frac{aad^2 - abc + bdd^2}{abd^2} = \frac{a^2d^2 - abc + bd^3}{abd^2}$$

$$\frac{2}{x+1} + \frac{4}{x+2} = \frac{2(x+2) + 4(x+1)}{(x+1)(x+2)} = \frac{2x+4+4x+4}{x^2+2x+x+2} =$$
$$= \frac{6x+8}{x^2+3x+2}$$

- multiplication and division

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$$

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

$$\frac{2a}{3b} : \frac{a^2b}{6} = \frac{2a}{3b} \cdot \frac{6}{a^2b} = \frac{\overset{4}{12a}}{\underset{1}{3a^2b^2}} = \frac{4}{ab^2}$$

$$\frac{2a}{3b} : \frac{a^2b}{6} \cdot \frac{ab}{2} = \frac{2a}{3b} \cdot \frac{6}{a^2b} \cdot \frac{ab}{2} = \frac{\overset{2}{12a^2b}}{\underset{1}{6a^2b^2}} = \frac{2}{b}$$

Review exercises

Multiply and simplify the results.

$$a) (2a+4b)(a-3b) = 2a^2 - 6ab + 4ab - 12b^2 = 2a^2 - 2ab - 12b^2$$

$$b) (9s^2+3)(s^2-4) = 9s^4 - 36s^2 + 3s^2 - 12 = 9s^4 - 33s^2 - 12.$$

Simplify each of the following expressions to a single algebraic fraction.

$$a) \frac{ab}{c} + \frac{cb}{a} = \frac{a^2b + bc^2}{ac}$$

$$b) \frac{ab}{c} - 1 = \frac{ab}{c} - \frac{c}{c} = \frac{ab-c}{c}$$

$$c) \left(\frac{ab}{c} + \frac{ac}{b} \right) + \frac{bc}{a} = \frac{ab^2 + ac^2}{bc} + \frac{bc}{a} = \frac{a^2b^2 + a^2c^2 + b^2c^2}{abc}$$

Perform the division.

$$\frac{a^3 + 8b^3}{a + 2b} =$$

$$\begin{array}{l} - \left\{ (a^3 + 8b^3) : (a + 2b) = a^2 - 2ab + 4b^2 \right. \\ \begin{array}{r} a^3 + 2a^2b \\ \hline 0 \end{array} \left\{ \begin{array}{l} -2a^2b \\ -2a^2b - 4ab^2 \end{array} \right. \\ \begin{array}{r} 0 \end{array} \left\{ \begin{array}{l} 4ab^2 + 8b^3 \\ 4ab^2 + 8b^3 \\ \hline 0 \end{array} \right. \end{array}$$

$$(a^2 - 2ab + 4b^2) \cdot (a + 2b) = (a^3 + 8b^3)$$