

Series: Mathematics - from zero to engineer (22).

Multiplication and division of algebraic expressions.

$$(2x + 5)(x^2 + 3x + 4)$$

$$\begin{array}{r} x^2 + 3x + 4 \\ 2x + 5 \\ \hline 2x^3 + 6x^2 + 8x \\ 5x^2 + 15x + 20 \\ \hline 2x^3 + 11x^2 + 23x + 20 \end{array}$$

$$(2x + 5)(x^2 + 3x + 4) = 2x^3 + 11x^2 + 23x + 20.$$

$$(2x + 6)(4x^3 - 5x - 7) = (2x + 6)(4x^3 + 0x^2 - 5x - 7)$$

$$\begin{array}{r} 4x^3 + 0x^2 - 5x - 7 \\ 2x + 6 \\ \hline 8x^4 + 0x^3 - 10x^2 - 14x \\ 24x^3 + 0x^2 - 30x - 42 \\ \hline 8x^4 + 24x^3 - 10x^2 - 44x - 42 \end{array}$$

$$(2x + 6)(4x^3 - 5x - 7) = 8x^4 + 24x^3 - 10x^2 - 44x - 42$$

$$(3x - 5)(2x^3 - 4x^2 + 8) = (3x - 5)(2x^3 - 4x^2 + 0x + 8)$$

$$\begin{array}{r} 2x^3 - 4x^2 + 0x + 8 \\ 3x - 5 \\ \hline 6x^4 - 12x^3 + 0x^2 + 24x \\ -10x^3 + 20x^2 - 0x - 40 \\ \hline 6x^4 - 22x^3 + 20x^2 + 24x - 40 \end{array}$$

$$(3x - 5)(2x^3 - 4x^2 + 8) = 6x^4 - 22x^3 + 20x^2 + 24x - 40$$

$$\begin{array}{r} (12x^3 - 2x^2 - 3x + 28) : (3x + 4) = 4x^2 - 6x + 7 \\ \underline{12x^3 + 16x^2} \\ 0 - 18x^2 - 3x \\ \underline{-18x^2 - 24x} \\ 0 - 21x + 28 \\ \underline{21x + 28} \\ 0 \end{array}$$

$$(3x + 4)(4x^2 - 6x + 7) = (12x^3 - 2x^2 - 3x + 28)$$

$$(4x^3 + 13x + 33) : (2x + 3)$$

$$\begin{array}{r} (4x^3 + 0x^2 + 13x + 33) : (2x + 3) = 2x^2 - 3x + 11 \\ \underline{4x^3 + 6x^2} \\ 0 - 6x^2 + 13x \\ \underline{-6x^2 - 9x} \\ 0 - 22x + 33 \\ \underline{22x + 33} \\ 0 \end{array}$$

$$(2x + 3)(2x^2 - 3x + 11) = (4x^3 + 0x^2 + 13x + 33)$$

$$(6x^3 - 7x^2 + 1) : (3x + 1)$$

$$- \left\{ \begin{array}{l} (6x^3 - 7x^2 + 0x + 1) : (3x + 1) = 2x^2 - 3x + 1 \\ 6x^3 + 2x^2 \end{array} \right.$$

$$\begin{array}{r} 0 - \{ -9x^2 + 0x \\ -9x^2 - 3x \\ 0 - \{ 3x + 1 \\ 3x + 1 \\ 0 \end{array}$$

$$(3x + 1)(2x^2 - 3x + 1) = (6x^3 - 7x^2 + 0x + 1)$$

Review exercises.

Multiply and simplify the results.

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

$$\begin{array}{r} 4x^2 - 3x + 2 \\ 8x - 4 \\ \hline 32x^3 - 24x^2 + 16x \\ -16x^2 + 12x - 8 \\ \hline 32x^3 - 40x^2 + 28x - 8 \end{array}$$

$$(8x - 4)(4x^2 - 3x + 2) = 32x^3 - 40x^2 + 28x - 8$$

$$b) (2x + 3)(5x^3 + 3x - 4) = (2x + 3)(5x^3 + 0x^2 + 3x - 4)$$

$$\begin{array}{r} 5x^3 + 0x^2 + 3x - 4 \\ 2x + 3 \\ \hline 10x^4 + 0x^3 + 6x^2 - 8x \\ 15x^3 + 0x^2 + 9x - 12 \\ \hline 10x^4 + 15x^3 + 6x^2 + x - 12 \end{array}$$

$$(2x + 3)(5x^3 + 3x - 4) = 10x^4 + 15x^3 + 6x^2 + x - 12$$

Perform the division.

$$a) - \left\{ \begin{array}{l} (x^2 + 5x - 6) : (x - 1) = x + 6 \\ x^2 - x \end{array} \right.$$

$$\begin{array}{r} 0 - \{ 6x - 6 \\ 6x - 6 \\ 0 \end{array}$$

$$(x - 1)(x + 6) = (x^2 + 5x - 6)$$

$$b) - \left\{ \begin{array}{l} (x^2 - x - 2) : (x + 1) = x - 2 \\ x^2 + x \end{array} \right.$$

$$\begin{array}{r} 0 - \{ -2x - 2 \\ -2x - 2 \\ 0 \end{array}$$

$$(x + 1)(x - 2) = (x^2 - x - 2)$$

$$c) \quad (12x^3 - 11x^2 - 25) : (3x - 5)$$

$$- \left\{ \begin{array}{r} (12x^3 - 11x^2 + 0x - 25) : (3x - 5) = 4x^2 + 3x + 5 \\ 12x^3 - 20x^2 \\ \hline 0 \quad 9x^2 + 0x \\ - \quad 9x^2 - 15x \\ \hline 0 \quad 15x - 25 \\ - \quad 15x - 25 \\ \hline 0 \end{array} \right.$$

$$(3x - 5)(4x^2 + 3x + 5) = (12x^3 - 11x^2 - 25)$$