Dividing Polynomials

When dividing polynomials, we divide the coefficients in the numerator by the coefficients in the denominator and we divide the variables in the numerator by the variables in the denominator when possible.

e.g. (1) $\frac{24y^2}{y} = 24y$

e.g. (2) $\frac{33c^2}{3c} = \frac{33}{3} \bullet \frac{c^2}{c}$

$= 11c$

e.g. (3) $\frac{45y^3}{9y} = \frac{45}{9} \bullet \frac{y^3}{y}$

$= 5y^2$

Note: When a polynomial expression is being divided by a monomial you divide each part of the polynomial by the monomial.

e.g. (1) $\frac{18x^5 + 9x^2 - 6x}{3x} = \frac{18x^5}{3x} + \frac{9x^2}{3x} - \frac{6x}{3x}$

$= 6x^4 + 3x - 2$

e.g. (2) $\frac{4x^5 + 6x}{2x^2} = \frac{4x^5}{2x^2} + \frac{6x}{2x^2}$

$= 2x^3 + 3x^{-1}$

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

e.g. (3) $$\frac{36z^3y^2 - 12xy^7}{3y^2} = \frac{36z^3y^2}{3y^2} - \frac{12xy^7}{3y^2}$$

$$= 12z^3 - 4xy^5$$

e.g. (4) $$(16x^3 + 8x) \div 2x = \frac{16x^3 + 8x}{2x}$$

$$= \frac{16x^3}{2x} + \frac{8x}{2x}$$

$$= 8x^2 + 4$$

e.g. (5) $$(12n^5 + 9n^4) \div 3n^2 = \frac{12n^5 + 9n^4}{3n^2}$$

$$= \frac{12n^5}{3n^2} + \frac{9n^4}{3n^2}$$

$$= 4n^3 + 3n^2$$

e.g. (6) $$(3x^3 + 9x^2 - 6x) \div 3 = \frac{3x^3}{3} + \frac{9x^2}{3} - \frac{6x}{3}$$

$$= x^3 + 3x^2 - 2x$$

e.g. (7) $4x^3 \div 2x + 8x^2 \div 4x - 6x^4 \div 3x^2$

For this question the easiest way is to group according to BEDMAS

$$\underbrace{4x^3 \div 2x} + \underbrace{8x^2 \div 4x} - \underbrace{6x^4 \div 3x^2}$$

$$= \frac{4x^3}{2x} + \frac{8x^2}{4x} - \frac{6x^4}{3x^2}$$

$$= 2x^2 + 2x - 2x^2$$

…now add like-terms….

$$= 2x$$

e.g. (8) $(12x^3 + 18x^2 - 6x) \div 6x = \frac{12x^3}{6x} + \frac{18x^2}{6x} - \frac{6x}{6x}$

$$= 2x^2 + 3x - 1$$