



EXAM 1_4 (Polynomials)

1) Work out:

(2.5 points)

a. $2(x^3 - x^2 + 2x - 3) - (2x^3 + 2x^2 - 1) =$

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

c. $(x^3 - 2x)(x^4 - x^2 + 2x - 1) =$

2) Complete:

(2 points)

a. $(1 + 2x)^2 = 1 + \dots + \dots$

b. $(\dots + 7)(\dots - 7) = 9x^4 - \dots$

c. $(\dots - \dots)^2 = x^4 - 8x^2 + \dots$

d. $(x - \dots)(x + \dots) = \dots - \frac{25}{9}$

3) Factorise the following:

(2.5 points)

a. $3x^3 - 18x^2 + 27x =$

b. $4x^2 - 9 =$

c. $mn^3 - 10mn^2 + 25mn =$

d. $27y^3 - 12y =$

e. $5xy^3 + 40xy^2 + 80xy =$

4) Work out and simplify:

(3 points)

a. $(x - 3)^2 - (x - 1)(x + 1) + 12x - 10 =$

b. $2(x - 2)^2 - 3x(2x - 3) - (1 + 2x)(1 - 2x) =$

c. $\frac{x+1}{2} - \frac{2x-2}{8} + \frac{1-2x}{6} - \frac{1}{12} =$

SOLUTION

1) Work out:

$$\begin{aligned} \text{a. } 2(x^3 - x^2 + 2x - 3) - (2x^3 + 2x^2 - 1) &= 2x^3 - 2x^2 + 4x - 6 - 2x^3 - 2x^2 + 1 = \\ &= -4x^2 + 4x - 5 \end{aligned}$$

$$\begin{aligned} \text{b. } (x^4 + 3x^3 - x^2 + 5) - 2x(x^4 - x^2 + 2) &= x^4 + 3x^3 - x^2 + 5 - 2x^5 + 2x^3 - 2x = \\ &= -2x^5 + x^4 + 5x^3 - x^2 - 4x + 5 \end{aligned}$$

$$\begin{aligned} \text{c. } (x^3 - 2x)(x^4 - x^2 + 2x - 1) &= x^7 - x^5 + 2x^4 - x^3 - 2x^5 + 2x^3 - 4x^2 + 2x = \\ &= x^7 - 3x^5 + 2x^4 + x^3 - 4x^2 + 2x \end{aligned}$$

2) Complete:

$$\text{a. } (1 + 2x)^2 = 1 + 4x + 4x^2$$

$$\text{b. } (3x^2 + 7)(3x^2 - 7) = 9x^4 - 49$$

$$\text{c. } (x^2 - 4)^2 = x^4 - 8x^2 + 16$$

$$\text{d. } \left(x - \frac{5}{3}\right)\left(x + \frac{5}{3}\right) = x^2 - \frac{25}{9}$$

3) Factorise the following:

$$\text{a. } 3x^3 - 18x^2 + 27x = 3x(x^2 - 6x + 9) = 3x(x - 3)^2$$

$$\text{b. } 4x^2 - 9 = (2x - 3)(2x + 3)$$

$$\text{c. } mn^3 - 10mn^2 + 25mn = mn(n^2 - 10n + 25) = mn(n - 5)^2$$

$$\text{d. } 27y^3 - 12y = 3y(9y^2 - 4) = 3y(3y - 2)(3y + 2)$$

$$\text{e. } 5xy^3 + 40xy^2 + 80xy = 5xy(y^2 + 8y + 16) = 5xy(y + 4)^2$$

4) Work out and simplify:

$$\begin{aligned} \text{a. } (x - 3)^2 - (x - 1)(x + 1) + 12x - 10 &= x^2 - 6x + 9 - (x^2 - 1) + 12x - 10 = \\ &= x^2 - 6x + 9 - x^2 + 1 + 12x - 10 = 6x \end{aligned}$$

b.

$$\begin{aligned} 2(x - 2)^2 - 3x(2x - 3) - (1 + 2x)(1 - 2x) &= 2(x^2 - 4x + 4) - 6x^2 + 9x - (1 - 4x^2) = \\ &= 2x^2 - 8x + 8 - 6x^2 + 9x - 1 + 4x^2 = x + 7 \end{aligned}$$

$$\begin{aligned} \text{c. } \frac{x+1}{2} - \frac{2x-2}{8} + \frac{1-2x}{6} - \frac{1}{12} &= \frac{12(x+1)}{24} - \frac{3(2x-2)}{24} + \frac{4(1-2x)}{24} - \frac{2}{24} = \\ &= \frac{12x+12}{24} - \frac{6x-6}{24} + \frac{4-8x}{24} - \frac{2}{24} = \frac{12x+12-6x+6+4-8x-2}{24} = \frac{10-x}{12} \end{aligned}$$