

EXAM UNIT 4 (POLYNOMIALS)

1) Work out: (2 points)

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

b. $(x^5 - 2x^3 + x^2 - x + 2) - 3x(x^4 - 2x^2 + 1) =$

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

2) Complete: (2 points)

a. $(3 + 2x)^2 = 9 + \dots +$

b. $(\dots - 3)(\dots + 3) = 4x^4 - \dots$

c. $(\dots - \dots)^2 = x^4 - 10x^2 + \dots$

d. $(x - \dots)(x + \dots) = \dots - \frac{9}{4}$

3) Factorise the following: (1 point)

a. $5x^3 - 10x^2 + 5x =$

b. $4x^2 - 9 =$

4) Simplify: (2 points)

a. $\frac{2x^3 - 2x}{6x^2 + 6x} =$

b. $\frac{2x^2(x^2 + 14x + 49)}{x(x^2 - 49)} =$

5) Work out and simplify: (3 points)

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

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

c. $\frac{x+3}{2} - \frac{3x+1}{9} + \frac{3-2x}{6} - \frac{1}{9} =$

SOLUTION

1) Work out:

$$\text{a. } 3(x^3 - 2x^2 + x - 5) - (3x^3 + 2x - 3) = 3x^3 - 6x^2 + 3x - 15 - 3x^3 - 2x + 3 = \\ = -6x^2 + x - 12$$

b.

$$(x^5 - 2x^3 + x^2 - x + 2) - 3x(x^4 - 2x^2 + 1) = x^5 - 2x^3 + x^2 - x + 2 - 3x^5 + 6x^3 - 3x = \\ = -2x^5 + 4x^3 + x^2 - 4x + 2$$

$$\text{c. } (2x^2 - 3)(x^3 - x^2 + 2) = 2x^5 - 2x^4 + 4x^2 - 3x^3 + 3x^2 - 6 = \\ = 2x^5 - 2x^4 - 3x^3 + 7x^2 - 6$$

2) Complete:

$$\text{a. } (3 + 2x)^2 = 9 + 12x + 4x^2$$

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

$$\text{c. } (x^2 - 5)^2 = x^4 - 10x^2 + 25$$

$$\text{d. } \left(x - \frac{3}{2}\right)\left(x + \frac{3}{2}\right) = x^2 - \frac{9}{4}$$

3) Factorise the following:

$$\text{a. } 5x^3 - 10x^2 + 5x = x(x^2 + 2x + 1) = x(x + 1)^2$$

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

4) Simplify:

$$\text{a. } \frac{2x^3 - 2x}{6x^2 + 6x} = \frac{2x(x^2 - 1)}{6x(x + 1)} = \frac{(x - 1)(x + 1)}{3(x + 1)} = \frac{x - 1}{3}$$

b.

$$\frac{2x^2(x^2 + 14x + 49)}{x(x^2 - 49)} = \frac{2x(x^2 + 14x + 49)}{(x^2 - 49)} = \frac{2x(x + 7)^2}{(x + 7)(x - 7)} = \frac{2x(x + 7)}{x - 7} = \frac{2x^2 + 14x}{x - 7}$$

5) Work out and simplify:

$$\text{a. } (x - 1)^2 - (x + 2)(x - 2) + 2x - 3 = x^2 - 2x + 1 - (x^2 - 4) + 2x - 3 = \\ = x^2 - 2x + 1 - x^2 + 4 + 2x - 3 = 2$$

$$\text{b. } 3(x - 3)(x + 3) - 3(x + 3)^2 = 3(x^2 - 9) - 3(x^2 + 6x + 9) = \\ = 3x^2 - 27 - 3x^2 - 18x - 27 = -18x - 54$$

$$\text{c. } \frac{x + 3}{2} - \frac{3x + 1}{9} + \frac{3 - 2x}{6} - \frac{1}{9} = \frac{9(x + 3)}{18} - \frac{2(3x + 1)}{18} + \frac{3(3 - 2x)}{18} - \frac{2}{18} = \\ = \frac{9x + 27}{18} - \frac{6x + 2}{18} + \frac{9 - 6x}{18} - \frac{2}{18} = \frac{9x + 27 - 6x - 2 + 9 - 6x - 2}{18} = \frac{-3x + 32}{18}$$