ALGEBRA

1   Giving your answers in descending powers of x, simplify

    a $(x^2 + 3x + 2) + (2x^2 + 5x + 1)$ **b** $(x^3 + 4x^2 + x - 6) + (x^2 - 3x + 7)$

    c $(4 - x + 2x^3) + (3 - x + 6x^2 - 5x^3)$ **d** $(x^5 + 8x^3 - 5x^2 - 9) + (-x^4 - 4x + 1)$

    e $(3x^3 - 7x^2 + 2) - (x^3 + 2x^2 + x - 6)$ **f** $(x^5 + 3x^4 - x^2 - 3) - (x^4 + 2x^3 - 3x + 2)$

    g $(2x^7 - 9x^5 + x^3 + x) - (3x^6 - 4x^3 + x + 5)$ **h** $2(x^4 + 4x^2 - 3) + (x^4 + 3x^3 - 8)$

    i $3(7 + 4x - x^2 - 2x^3) + 5(-2 - 3x + x^3)$ **j** $6(x^3 + 5x^2 - 2) - 3(2x^3 - x^2 - x)$

    k $8(x^4 + 2x^2 - 4x - 1) - 2(5 - 3x + x^3)$ **l** $7(x^6 + 3x^3 + x^2 - 4) - 4(2x^6 + x^5 - 3x - 7)$

2   Simplify

    a $(3y^2 + 2y + 1) + (y^3 - 4y^2 + 7y) + (2y^3 - y^2 - 8y + 5)$

    b $3(t^4 - t^3 + 4t) + (6 - t - 3t^3) + 2(t^4 - 2t^2 + 4)$

    c $(x^3 - 6x^2 + 8) + (5x^2 - x + 1) - (2x^3 + 3x^2 + x - 7)$

    d $2(3 + m + 7m^2 - 3m^5) + 6(1 - m^2 + 2m^4) - 5(m^5 + 3m^3 - m^2 + 2)$

    e $\frac{1}{3}(1 - 2u + \frac{3}{5}u^2 + 3u^4) - \frac{1}{2}(2 - u + \frac{2}{3}u^2 - \frac{1}{2}u^3)$

3   Giving your answers in ascending powers of x, simplify

    a $x(2 - 3x + x^2) + 4(1 + 2x^2 - x^3)$ **b** $x(x^4 + 7x^2 - 5x + 9) - 2(x^4 - 4x^3 - 3)$

    c $2x(-5 + 4x - x^3) + 7(2 - 3x^2 + x^4)$ **d** $x^2(8 + 2x + x^2) - 3(5 + 4x^2 + x^3)$

    e $3x^2(x + 3) - x(x^3 + 4x^2) + 5(x^3 - 2x)$ **f** $x^2(6 - x + 5x^2) + 7x(2 - x^3) + 4(1 - 3x - x^2)$

4   Show that

    a $(3x + 1)(x^2 - 2x + 4) \equiv 3x^3 - 5x^2 + 10x + 4$

    b $(1 + 2x - x^2)(1 - 2x + x^2) \equiv 1 - 4x^2 + 4x^3 - x^4$

    c $(3 - x)^3 \equiv 27 - 27x + 9x^2 - x^3$

5   Giving your answers in descending powers of x, expand and simplify

    a $(x + 1)(x^2 + 5x - 6)$ **b** $(2x - 5)(x^2 - 3x + 7)$

    c $(4 - 7x)(2 + 5x - x^2)$ **d** $(3x - 2)^3$

    e $(x^2 + 3)(2x^2 - x + 9)$ **f** $(4x - 1)(x^4 - 3x^2 + 5x + 2)$

    g $(x^2 + 2x + 5)(x^2 + 3x + 1)$ **h** $(x^2 + x - 3)(2x^2 - x + 4)$

    i $(3x^2 - 5x + 2)(2x^2 - 4x - 8)$ **j** $(x^2 + 2x - 6)^2$

    k $(x^3 + 4x^2 + 1)(2x^4 + x^2 + 3)$ **l** $(6 - 2x + x^3)(3 + x^2 - x^3 + 2x^4)$

6   Simplify

    a $(p^2 - 1)(p + 4)(2p + 3)$

    b $(t + 2)(t^2 + 3t + 5) + (t + 4)(t^2 + t + 7)$

    c $2(x^2 - 3)(x^2 + x - 4) + (3x - 1)(4x^3 + 2x^2 - x + 6)$

    d $(u^3 - 4u^2 - 3)(u + 2) - (2u^3 + u - 1)(u^2 + 5u - 3)$