ALGEBRA — *Answers*

1 **a** $= 3x^2 + 8x + 3$

b $= x^3 + 5x^2 - 2x + 1$

c $= -3x^3 + 6x^2 - 2x + 7$

d $= x^5 - x^4 + 8x^3 - 5x^2 - 4x - 8$

e $= 3x^3 - 7x^2 + 2 - x^3 - 2x^2 - x + 6$
$= 2x^3 - 9x^2 - x + 8$

f $= x^5 + 3x^4 - x^2 - 3 - x^4 - 2x^3 + 3x - 2$
$= x^5 + 2x^4 - 2x^3 - x^2 + 3x - 5$

g $= 2x^7 - 9x^5 + x^3 + x - 3x^6 + 4x^3 - x - 5$
$= 2x^7 - 3x^6 - 9x^5 + 5x^3 - 5$

h $= 2x^4 + 8x^2 - 6 + x^4 + 3x^3 - 8$
$= 3x^4 + 3x^3 + 8x^2 - 14$

i $= 21 + 12x - 3x^2 - 6x^3 - 10 - 15x + 5x^3$
$= -x^3 - 3x^2 - 3x + 11$

j $= 6x^3 + 30x^2 - 12 - 6x^3 + 3x^2 + 3x$
$= 33x^2 + 3x - 12$

k $= 8x^4 + 16x^2 - 32x - 8 - 10 + 6x - 2x^3$
$= 8x^4 - 2x^3 + 16x^2 - 26x - 18$

l $= 7x^6 + 21x^3 + 7x^2 - 28 - 8x^6 - 4x^5 + 12x + 28$
$= -x^6 - 4x^5 + 21x^3 + 7x^2 + 12x$

2 **a** $= 3y^3 - 2y^2 + y + 6$

b $= 3t^4 - 3t^3 + 12t + 6 - t - 3t^3 + 2t^4 - 4t^2 + 8$
$= 5t^4 - 6t^3 - 4t^2 + 11t + 14$

c $= x^3 - 6x^2 + 8 + 5x^2 - x + 1 - 2x^3 - 3x^2 - x + 7$
$= -x^3 - 4x^2 - 2x + 16$

d $= 6 + 2m + 14m^2 - 6m^5 + 6 - 6m^2 + 12m^4 - 5m^5 - 15m^3 + 5m^2 - 10$
$= 2 + 2m + 13m^2 - 15m^3 + 12m^4 - 11m^5$

e $= \frac{1}{3} - \frac{2}{3}u + \frac{1}{5}u^2 + u^4 - 1 + \frac{1}{2}u - \frac{1}{3}u^2 + \frac{1}{4}u^3$
$= -\frac{2}{3} - \frac{1}{6}u - \frac{2}{15}u^2 + \frac{1}{4}u^3 + u^4$

3 **a** $= 2x - 3x^2 + x^3 + 4 + 8x^2 - 4x^3$
$= 4 + 2x + 5x^2 - 3x^3$

b $= x^5 + 7x^3 - 5x^2 + 9x - 2x^4 + 8x^3 + 6$
$= 6 + 9x - 5x^2 + 15x^3 - 2x^4 + x^5$

c $= -10x + 8x^2 - 2x^4 + 14 - 21x^2 + 7x^4$
$= 14 - 10x - 13x^2 + 5x^4$

d $= 8x^2 + 2x^3 + x^4 - 15 - 12x^2 - 3x^3$
$= -15 - 4x^2 - x^3 + x^4$

e $= 3x^3 + 9x^2 - x^4 - 4x^3 + 5x^3 - 10x$
$= -10x + 9x^2 + 4x^3 - x^4$

f $= 6x^2 - x^3 + 5x^4 + 14x - 7x^4 + 4 - 12x - 4x^2$
$= 4 + 2x + 2x^2 - x^3 - 2x^4$

4 **a** LHS $= (3x + 1)(x^2 - 2x + 4)$
$= 3x(x^2 - 2x + 4) + (x^2 - 2x + 4)$
$= 3x^3 - 6x^2 + 12x + x^2 - 2x + 4$
$= 3x^3 - 5x^2 + 10x + 4$ = RHS

b LHS $= (1 + 2x - x^2)(1 - 2x + x^2)$
$= (1 - 2x + x^2) + 2x(1 - 2x + x^2) - x^2(1 - 2x + x^2)$
$= 1 - 2x + x^2 + 2x - 4x^2 + 2x^3 - x^2 + 2x^3 - x^4$
$= 1 - 4x^2 + 4x^3 - x^4$ = RHS

c LHS $= (3 - x)^3$
$= (3 - x)(9 - 6x + x^2)$
$= 3(9 - 6x + x^2) - x(9 - 6x + x^2)$
$= 27 - 18x + 3x^2 - 9x + 6x^2 - x^3$
$= 27 - 27x + 9x^2 - x^3$ = RHS

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5 **a** $= x(x^2 + 5x - 6) + (x^2 + 5x - 6)$
$= x^3 + 5x^2 - 6x + x^2 + 5x - 6$
$= x^3 + 6x^2 - x - 6$

b $= 2x(x^2 - 3x + 7) - 5(x^2 - 3x + 7)$
$= 2x^3 - 6x^2 + 14x - 5x^2 + 15x - 35$
$= 2x^3 - 11x^2 + 29x - 35$

c $= 4(2 + 5x - x^2) - 7x(2 + 5x - x^2)$
$= 8 + 20x - 4x^2 - 14x - 35x^2 + 7x^3$
$= 7x^3 - 39x^2 + 6x + 8$

d $= (3x - 2)(3x - 2)^2 = (3x - 2)(9x^2 - 12x + 4)$
$= 3x(9x^2 - 12x + 4) - 2(9x^2 - 12x + 4)$
$= 27x^3 - 36x^2 + 12x - 18x^2 + 24x - 8$
$= 27x^3 - 54x^2 + 36x - 8$

e $= x^2(2x^2 - x + 9) + 3(2x^2 - x + 9)$
$= 2x^4 - x^3 + 9x^2 + 6x^2 - 3x + 27$
$= 2x^4 - x^3 + 15x^2 - 3x + 27$

f $= 4x(x^4 - 3x^2 + 5x + 2) - (x^4 - 3x^2 + 5x + 2)$
$= 4x^5 - 12x^3 + 20x^2 + 8x - x^4 + 3x^2 - 5x - 2$
$= 4x^5 - x^4 - 12x^3 + 23x^2 + 3x - 2$

g $= x^2(x^2 + 3x + 1) + 2x(x^2 + 3x + 1) + 5(x^2 + 3x + 1)$
$= x^4 + 3x^3 + x^2 + 2x^3 + 6x^2 + 2x + 5x^2 + 15x + 5$
$= x^4 + 5x^3 + 12x^2 + 17x + 5$

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

i $= 3x^2(2x^2 - 4x - 8) - 5x(2x^2 - 4x - 8) + 2(2x^2 - 4x - 8)$
$= 6x^4 - 12x^3 - 24x^2 - 10x^3 + 20x^2 + 40x + 4x^2 - 8x - 16$
$= 6x^4 - 22x^3 + 32x - 16$

j $= x^2(x^2 + 2x - 6) + 2x(x^2 + 2x - 6) - 6(x^2 + 2x - 6)$
$= x^4 + 2x^3 - 6x^2 + 2x^3 + 4x^2 - 12x - 6x^2 - 12x + 36$
$= x^4 + 4x^3 - 8x^2 - 24x + 36$

k $= x^3(2x^4 + x^2 + 3) + 4x^2(2x^4 + x^2 + 3) + (2x^4 + x^2 + 3)$
$= 2x^7 + x^5 + 3x^3 + 8x^6 + 4x^4 + 12x^2 + 2x^4 + x^2 + 3$
$= 2x^7 + 8x^6 + x^5 + 6x^4 + 3x^3 + 13x^2 + 3$

l $= 6(3 + x^2 - x^3 + 2x^4) - 2x(3 + x^2 - x^3 + 2x^4) + x^3(3 + x^2 - x^3 + 2x^4)$
$= 18 + 6x^2 - 6x^3 + 12x^4 - 6x - 2x^3 + 2x^4 - 4x^5 + 3x^3 + x^5 - x^6 + 2x^7$
$= 2x^7 - x^6 - 3x^5 + 14x^4 - 5x^3 + 6x^2 - 6x + 18$

6 **a** $= (p^2 - 1)(2p^2 + 11p + 12)$
$= p^2(2p^2 + 11p + 12) - (2p^2 + 11p + 12)$
$= 2p^4 + 11p^3 + 12p^2 - 2p^2 - 11p - 12$
$= 2p^4 + 11p^3 + 10p^2 - 11p - 12$

b $= t(t^2 + 3t + 5) + 2(t^2 + 3t + 5) + t(t^2 + t + 7) + 4(t^2 + t + 7)$
$= t^3 + 3t^2 + 5t + 2t^2 + 6t + 10 + t^3 + t^2 + 7t + 4t^2 + 4t + 28$
$= 2t^3 + 10t^2 + 22t + 38$

c $= 2x^2(x^2 + x - 4) - 6(x^2 + x - 4) + 3x(4x^3 + 2x^2 - x + 6) - (4x^3 + 2x^2 - x + 6)$
$= 2x^4 + 2x^3 - 8x^2 - 6x^2 - 6x + 24 + 12x^4 + 6x^3 - 3x^2 + 18x - 4x^3 - 2x^2 + x - 6$
$= 14x^4 + 4x^3 - 19x^2 + 13x + 18$

d $= u(u^3 - 4u^2 - 3) + 2(u^3 - 4u^2 - 3) - 2u^3(u^2 + 5u - 3) - u(u^2 + 5u - 3) + (u^2 + 5u - 3)$
$= u^4 - 4u^3 - 3u + 2u^3 - 8u^2 - 6 - 2u^5 - 10u^4 + 6u^3 - u^3 - 5u^2 + 3u + u^2 + 5u - 3$
$= -2u^5 - 9u^4 + 3u^3 - 12u^2 + 5u - 9$

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