

## Ex 2.1.1

$$a) 3 + (xz + y^2) = \underline{3 + xz + y^2}$$

$$b) 3 - (xz + y^2) = \underline{3 - xz - y^2}$$

$$c) 3(xz + y^2) = \underline{3xz + 3y^2}$$

$$d) (2a + b - c) + (3a - b + c) = \underline{2a + b - c + 3a - b + c} = \underline{5a}$$

$$e) (2a + b - c) - (3a - b + c) = \underline{2a + b - c - 3a - b + c} = \underline{-a + 2b - 2c}$$

$$f) (2a + b - c)(3a - b + c) = \underline{6a^2 - 2ab + 2ac + 3ab - b^2 + bc - 3ac + bc - c^2}$$
$$= \underline{6a^2 - b^2 - c^2 + ab - ac + 2bc}$$

$$g) (x^3 - 2x^2 - 5) + (-4x^3 - 1) = \underline{x^3 - 2x^2 - 5 - 4x^3 - 1} = \underline{-3x^3 - 2x^2 - 6}$$

$$h) (x^3 - 2x^2 - 5) - (-4x^3 - 1) = \underline{x^3 - 2x^2 - 5 + 4x^3 + 1} = \underline{5x^3 - 2x^2 - 4}$$

$$i) (x^3 - 2x^2 - 5)(-4x^3 - 1) = -4x^6 - x^3 + 8x^5 + 2x^2 + 20x^3 + 5$$
$$= \underline{-4x^6 + 8x^5 + 19x^3 + 2x^2 + 5}$$

## Ex 2.1.2

$$a) (a + b)^2 = a^2 + 2ab + b^2$$

$$b) (a - b)^2 = a^2 - 2ab + b^2$$

$$c) (a + b)(a - b) = a^2 - b^2$$

$$d) (a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$e) (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$$

$$f) (a - b)(a^2 + ab + b^2) = a^3 - b^3$$

$$g) (a + b)(a^2 - ab + b^2) = a^3 + b^3$$



### Ex 2.1.3

$$a) (a+8)^2 = \underline{a^2 + 16a + 64}$$

$$b) (y^4 - 3b)^3 = y^{12} - 3y^8 \cdot 3b + 3y^4 \cdot 9b^2 + 27b^3 \\ = \underline{y^{12} - 9y^8b + 27y^4b^2 + 27b^3}$$

$$c) (u-3)(u+3) = \underline{u^2 - 9}$$

$$d) (2m - 5n)(4m^2 + 10mn + 25n^2) = (2m)^3 - (5n)^3 = \underline{8m^3 - 125n^3}$$

$$e) (7-f)^2 = \underline{49 - 14f + f^2}$$

$$f) (4 + 2z^2)^3 = 64 + 3 \cdot 16 \cdot 2z^2 + 3 \cdot 4 \cdot 4z^4 + 8z^6 \\ = \underline{64 + 96z^2 + 48z^4 + 8z^6}$$

$$g) (3+y^3)(y^6 - 3y^3 + 9) = \underline{y^9 + 27}$$

$$h) (x^2 + y^2)(x^2 - y^2) = \underline{x^4 - y^4}$$

$$i) (t + 3u^5)^3 = t^3 + 3t^2 \cdot 3u^5 + 3t \cdot 9u^{10} + 27u^{15} \\ = \underline{t^3 + 9t^2u^5 + 27tu^{10} + 27u^{15}}$$

$$j) (2x-7)^2 = \underline{4x^2 - 28x + 49}$$

$$k) (b^2 - c^3)(b^2c^3 + b^4 + c^6) = \underline{b^6 - c^9}$$

$$l) (a-3b)^3 = a^3 - 3a^2 \cdot 3b + 3a \cdot 9b^2 + 27b^3 \\ = \underline{a^3 - 9a^2b + 27ab^2 + 27b^3}$$

### Ex 2.1.4

$$a) (x-1)^2 - (y+1)^2 = x^2 - 2x + 1 - (y^2 - 2y + 1) \\ = x^2 - 2x + 1 - y^2 + 2y - 1 \\ = \underline{x^2 - y^2 - 2x + 2y}$$

$$b) (1+x)^2 - (1-x)^2 = 1 + 2x + x^2 - (1 - 2x + x^2) \\ = 1 + 2x + x^2 - 1 + 2x - x^2 = \underline{4x}$$

$$c) \left(\frac{1}{2}x + \frac{1}{2}y\right)^2 - \left(\frac{1}{2}x - \frac{1}{2}y\right)^2 = \frac{1}{4}x^2 + \frac{1}{2}xy + \frac{1}{4}y^2 - \left(\frac{1}{4}x^2 - \frac{1}{2}xy + \frac{1}{4}y^2\right) = \underline{xy}$$

$$d) (2x+y)^2 + (2x-y)^2 - 2(2x+y)(2x-y) \\ = 4x^2 + 4xy + y^2 + 4x^2 - 4xy + y^2 - 2(4x^2 - y^2) \\ = 8x^2 + 2y^2 - 8x^2 + 2y^2 = \underline{4y^2}$$

$$e) (3x+y)(3x-y) - (3x+2y)^2 - (x-3y)^2 \\ = 9x^2 - y^2 - (9x^2 + 12xy + 4y^2) - (x^2 - 6xy + 9y^2) \\ = \underline{9x^2} - \underline{y^2} - \underline{9x^2} - \underline{12xy} - \underline{4y^2} - \underline{x^2} + \underline{6xy} - \underline{9y^2} \\ = \underline{-x^2 - 14y^2 - 6xy}$$

$$f) (x+2)^2 - (x+1)^2 - (x+1)(x-1) - x(x+4) - 4 \\ = x^2 + 4x + 4 - (x^2 + 2x + 1) - (x^2 - 1) - x^2 - 4x - 4 \\ = \underline{x^2} + \underline{4x} + \underline{4} - \underline{x^2} - \underline{2x} - \underline{1} - \underline{x^2} + \underline{1} - \underline{x^2} - \underline{4x} - \underline{4} \\ = \underline{-2x^2 - 2x}$$

$$g) (x+y)(x-y) + (x-y)^2 - (x+y)^2 + y(4x+y) \\ = x^2 - y^2 + x^2 - 2xy + y^2 - (x^2 + 2xy + y^2) + 4xy + y^2 \\ = \underline{x^2} - \underline{y^2} + \underline{x^2} - \underline{2xy} + \underline{y^2} - \underline{x^2} - \underline{2xy} - \underline{y^2} + \underline{4xy} + \underline{y^2} \\ = \underline{x^2}$$

Ex 2.1.6  $p(x) = 2x^3 - 3x^2 + 5x - 1$   $q(x) = 3x^3 + 2x^2 - 4x + 2$

a)  $p(x) + q(x) = \underline{5x^3 - x^2 + x + 1}$

b) degré de  $p \cdot q$  :  $2x^3 \cdot 3x^3 = 6x^6$  le degré vaut 6

terme de degré 4 :  $2x^3 \cdot (-4x) + (-3x^2) \cdot 2x^2 + 5x \cdot 3x^3$

$$= -8x^4 - 6x^4 + 15x^4$$

$$= 1x^4 = 1 \cdot x^4 \Rightarrow \text{le coefficient vaut } \underline{1}$$

Ex 2.1.7

$p(x) = x^2 + x + 2$   $q(x) = x^3 - 2x$

$$p(x) + q(x) = \underline{x^3 + x^2 - x + 2}$$

$$p(x) - q(x) = x^2 + x + 2 - x^3 + 2x = \underline{-x^3 + x^2 + 3x + 2}$$

$$p(x) \cdot q(x) = (x^2 + x + 2)(x^3 - 2x) = x^5 - \underline{2x^3} + x^4 - \underline{2x^2} + \underline{2x^3} - 4x$$
$$= \underline{x^5 + x^4 - 2x^2 - 4x}$$

Ex 2.1.8

$a(x) = 3x^2 - 4x + 3$

$p(x) = x^4 + 2x^3 - 2x^2 - 4x + 17$  et  $q(x) = 2x^3 - 3x^2 - 5x + 18$

a)  $(a(x))^2 = 9x^4 + \underline{16x^2} + 9 - 24x^3 + \underline{18x^2} - 24x$

$$= \underline{9x^4 - 24x^3 + 34x^2 - 24x + 9}$$

b)  $p(x) - q(x) = x^4 + \underline{2x^3} - \underline{2x^2} - \underline{4x} + \underline{17} - \underline{2x^3} + \underline{3x^2} + \underline{5x} - \underline{18}$

$$= \underline{x^4 + x^2 + x - 1}$$

c) degré de  $p(x) \cdot q(x)$  :  $x^4 \cdot 2x^3 = 2x^7 \Rightarrow$  le degré vaut 7

d) coefficient du terme de degré 7 : 2

$$\begin{aligned}
 \text{e) terme de degré 4 : } & x^4 \cdot 18 + 2x^3 \cdot (-5x) - 2x^2(-3x^2) - 4x \cdot 2x^3 \\
 & = 18x^4 - 10x^4 + 6x^4 - 8x^4 \\
 & = 6x^4 \quad \Rightarrow \text{le coefficient vaut } \underline{6}
 \end{aligned}$$

Ex 2.1.9

$$\begin{aligned}
 \text{a) } & (2x - y - z) - (3x + 2y - 3z) - (4x + y - z) + (5x + 4y - 4z) \\
 & = \underline{2x} - \underline{y} - \underline{z} - \underline{3x} - \underline{2y} + \underline{3z} - \underline{4x} - \underline{y} + \underline{z} + \underline{5x} + \underline{4y} - \underline{4z} = \underline{-z}
 \end{aligned}$$

$$\begin{aligned}
 \text{f) } & (3x^2 - x + 2)(4x + 3)(2x - 1) \\
 & = (12x^3 + 9x^2 - 4x^2 - 3x + 8x + 6)(2x - 1) \\
 & = (12x^3 + 5x^2 + 5x + 6)(2x - 1) \\
 & = 24x^4 - 12x^3 + 10x^3 - 5x^2 + 10x^2 - 5x + 12x - 6 \\
 & = \underline{24x^4 - 2x^3 + 5x^2 + 7x - 6}
 \end{aligned}$$

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

## Ex 2.1.10

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

$$(x-2)^3 = x^3 - 3 \cdot x^2 \cdot 2 + 3 \cdot x \cdot 4 - 8$$

$$= (x+1)(x^2-2x+1) - (x^3 - 6x^2 + 12x - 8)$$

$$= \underline{x^3} - \underline{2x^2} + \underline{x} + \underline{x^2} - \underline{2x} + 1 - \underline{x^3} + \underline{6x^2} - \underline{12x} + 8$$

$$= \underline{5x^2 - 11x + 9}$$

$$d) (x+y)^3 - (x-y)^3 - (x^3-y^3) - (x-y)(x^2+xy+y^2)$$

$$= x^3 + 3x^2y + 3xy^2 + y^3 - (x^3 - 3x^2y + 3xy^2 - y^3) - x^3 + y^3 - (x^3 - y^3)$$

$$= \underline{x^3} + \underline{3x^2y} + \underline{3xy^2} + \underline{y^3} - \underline{x^3} + \underline{3x^2y} - \underline{3xy^2} + \underline{y^3} - \underline{x^3} + \underline{y^3} - \underline{x^3} + \underline{y^3}$$

$$= \underline{-2x^3 + 6x^2y + 4y^3}$$

$$g) (2x-3y)^3 - 3y(x-3y)^2 - 9xy(4y-x)$$

$$= 8x^3 - 36x^2y + 54xy^2 + 27y^3 - 3y(x^2 - 6xy + 9y^2) - 36xy^2 + 9x^2y$$

$$= \underline{8x^3} - \underline{36x^2y} + \underline{54xy^2} - \underline{27y^3} - \underline{3x^2y} + \underline{18xy^2} - \underline{27y^3} - \underline{36xy^2} + \underline{9x^2y}$$

$$= \underline{8x^3 - 30x^2y + 36xy^2 - 54y^3}$$