

2. Subtract P from Q when

i) $P = 3x^4 + 5x^3 + 2x^2 - x$ $Q = 4x^4 + 2x^2 + x^3 - x + 1$

$$\begin{array}{r} 4x^4 + 2x^2 + x^3 - x + 1 \\ \oplus 3x^4 \oplus 2x^2 \oplus 5x^3 \oplus x \\ \hline x^4 \qquad \qquad -4x^3 \qquad \qquad + 1 \end{array}$$

Answer = $x^4 - 4x^3 + 1$

ii) $P = 2x + 3y - 4z - 1$ $Q = 2y + 3x - 4z + 1$

$Q = 3x + 2y - 4z + 1$ $P = 2x + 3y - 4z + 1$

$$\begin{array}{r} 3x + 2y - 4z + 1 \\ \oplus 2x \oplus 3y \oplus 4z \oplus 1 \\ \hline x - y \end{array}$$

Answer = $x - y$

iii) $P = a^3 + 2a^2b + 3ab^2 + b^3$

$Q = a^3 - 3a^2b + 3ab^2 - b^3$

$$\begin{array}{r} a^3 - 3a^2b + 3ab^2 - b^3 \\ \oplus a^3 \oplus 2a^2b \oplus 3ab^2 \oplus b^3 \\ \hline -5a^2b \qquad \qquad -2b^3 \end{array}$$

Answer = $-5a^2b - 2b^3$

Exercise # 5.2

(1) Add Solutions

(i) $1 + 2x + 3x^2, 3x - 4 - 2x^2, x^2 - 5x + 4$

$$\begin{array}{r} 3x^2 + 2x + 1 \\ - 2x^2 + 3x - 4 \\ \hline x^2 - 5x + 4 \\ \hline 2x^2 + 1 \end{array}$$

(ii) $a^3 + 2a^2 - 6a + 7, a^3 + 2a + 5, 2a^3 + 2a - a^2$

$$\begin{array}{r} a^3 + 2a^2 - 6a + 7 \\ a^3 + 0 + 2a + 5 \\ 2a^3 - a^2 + 2a - 8 \\ \hline 4a^3 + a^2 - 2a + 4 \end{array}$$

(iii) $a^3 - 2a^2b + b^3, 4a^3 + 2ab^2 + 6a^2b,$

$$2b^3 - 5a^3 - 4a^3b$$

$$\begin{array}{r} a^3 - 2a^2b + b^3 + 0 \\ 4a^3 + 6a^2b + 0 + 2ab^2 \\ - 5a^3 + 0 + 2b^3 + 0 + (-4a^3b) \\ \hline 0 + 4a^2b + 4b^3 + 2ab^2 - 4a^3b \end{array}$$

3) Find value of $x - 2y + 3z$
when

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

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

$$z = a^4 + 3a^3 - 6 - 5a^2$$

Sol:

$$\begin{aligned} & x - 2y + 3z \\ &= (2a^2 - a^3 + 3a + 4) - 2(2a^3 - 3a^2 + 2 - 2a) \\ & \quad + 3(a^4 + 3a^3 - 6 - 5a^2) \\ &= 2a^2 - a^3 + 3a + 4 - 4a^3 + 6a^2 - 4 + 4a \\ & \quad + 3a^4 + 9a^3 - 18 - 15a^2 \\ &= 2a^2 + 6a^2 - 15a^2 - a^3 - 4a^3 + 9a^3 + 3a + 4 \\ & \quad + 4 - 4 + (-18) + 3a^4 \\ &= 3a^4 + 4a^3 - 7a^2 + 7a - 18 \end{aligned}$$

6. Find Product

$$(i) (x+3)(x^2-3x+9)$$

$$= x(x^2-3x+9) + 3(x^2-3x+9)$$

$$= x^3 - 3x^2 + 9x + 3x^2 - 9x + 27$$

$$= x^3 + 27$$

$$(ii) (3x^2-7x+5)(4x^2-2x+1)$$

$$= 3x^2(4x^2-2x+1) - 7x(4x^2-2x+1)$$

$$+ 5(4x^2-2x+1)$$

$$= \left[\text{blacked out area} \right]$$

$$= 12x^4 - 6x^3 + 3x^2 - 28x^3 + 14x^2 - 7x + 20x^2 - 10x + 5$$

$$= 12x^4 - 34x^3 + 37x^2 - 17x + 5$$

$$(iii) (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$$

$$= a(a^2+b^2+c^2-ab-bc-ca) + b$$

$$(a^2+b^2+c^2-ab-bc-ca) + c$$

$$(a^2+b^2+c^2-ab-bc-ca)$$

4. The Sum of two polynomials is $x^2 + 2x - y^2$, if one polynomial is $x^2 - 2xy + 3$, Then find other?

Sum of two polynomial = $x^2 + 2x - y^2$

one polynomial = $x^2 - 2xy + 3$

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

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

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

5). Subtract $4x + 6 - 2x^2$ from

the sum of $x^3 + x^2 - 2x$ and

$2x^3 + 3x - 7$

$$= \begin{array}{r} x^3 + x^2 - 2x + 0 \\ 2x^3 + 0 + 3x - 7 \\ \hline 3x^3 + x^2 + x - 7 \end{array} \left. \vphantom{\begin{array}{r} x^3 + x^2 - 2x + 0 \\ 2x^3 + 0 + 3x - 7 \\ \hline 3x^3 + x^2 + x - 7 \end{array}} \right\} \text{Sum}$$

$$\begin{array}{r} 3x^3 + x^2 + x - 7 \\ \oplus 2x^2 \oplus 4x \oplus 6 \\ \hline 3x^3 + 3x^2 - 3x - 13 \end{array} \left. \vphantom{\begin{array}{r} 3x^3 + x^2 + x - 7 \\ \oplus 2x^2 \oplus 4x \oplus 6 \\ \hline 3x^3 + 3x^2 - 3x - 13 \end{array}} \right\} \begin{array}{l} \text{Subtraction} \\ \text{Answer} \end{array}$$

$$= a^3 + ab^2 + ac^2 - a^2b - abc - ca^2 + a^2b + b^3 + bc^2 - ab^2 - b^2c - abc + ca^2 + b^2c + c^3 - abc - bc^2 - c^2a$$

$$= a^3 + b^3 + c^3 - 3abc$$

7. If $P = x^2 - yz$, $Q = y^2 - xz$
and $R = -xy + z^2$

$P = x^2 - yz$ $Q = -xz + y^2$ $R = z^2 - xy$

$$PQ = (x^2 - yz)(y^2 - xz)$$

$$= x^2(y^2 - xz) - yz(y^2 - xz)$$

$$= x^2y^2 - x^3z - y^3z + xyz^2$$

$$QR = (y^2 - xz)(z^2 - xy)$$

$$= y^2(z^2 - xy) - xz(z^2 - xy)$$

$$= y^2z^2 - xy^3 - xz^3 + x^2yz$$

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

$$= \cancel{x^2y^2z^2} - x^3z^3 - y^3z^3 + xyz^4 - \cancel{x^3y^3} - x^4zy$$

$$- xy^4z - \cancel{x^2y^2z^2}$$

$$= -x^3y^3 - x^3z^3 + x^4yz - y^3z^3 + xy^4z + xyz^4$$