Chapter # 7

LAWS OF EXPONENTS FUNDAMENTAL OPERATION OF POLYNOMIALS

EXERCISE 7.1

Q.1 ***Write the following expression in (a) descending order and (b) ascending order?***

(i) $y^3 + y - 2y^2 - 1$

(ii) $6 - 7x^5 + 8x^4 + x^3$

(iii) $4a^2 - 3 - 5a - a^4$

(iv) $10x^2 - 5x^6 + 3 - 2x^6 + 4x$

Solution:

(i) Desending order: $y^3 - 2y^2 + y - 1$
Asending order: $-1 + y - 2y^2 + y^3$

(ii) Desending order: $-7x^5 + 8x^4 + a^3 + 6$
Asending order: $6 + x^3 + 8x^4 - 7x^5$

(iii) Desending order: $a^4 + 4a^2 - 5a - 3$
Asending order: $-3 - 5a - 4a^2 - a^4$

(iv) Desending order: $-5x^6 - 2x^4 - 10x^2 + 4x + 3$
Asending order: $3 + 4x + 10x^4 - 2x^2 - 5x^6$

Q.2 ***Add up the exspressions?***

(i) $5x^3 + 2x^2 - 1$, $3x^3 - 7x^2 + 8$, $x^3 + 2x + 1$

Solution:

$$\begin{array}{r} 5x^3 + 2x^2 - 1 \\ 3x^3 - 7x^2 + 8 \\ x^3 \quad + 1 + 2x \\ \hline 9x^3 - 5x^2 + 8 + 2x \end{array}$$

$9x^3 - 5x^2 + 2x + 8$. ***Ans***

(ii) $2a-5+6a^2,\quad 5a^2-3a+8,\quad -5a+3a^2-1$

Solution:

$$\begin{array}{l} 6a^2-2a-5 \\ 5a^2-3a+8 \\ \underline{3a^2-5a-1} \\ 14a^2-9+2. \end{array}$$

Ans

(iii) $xy+x^2y^2-x^3y^3,\qquad -xy-x^2y^2+y^3y^3$

$xy+x^2y^2$

Solution:

$$\begin{array}{l} -x^3y^3+x^2y^2+xy \\ x^3y^3-x^2y^2-xy \\ \underline{x^2y^2+xy} \\ \underline{x^2y^2+xy} \end{array}$$

Ans

N.B: While solving these types of questions, the express must, first, be correcfted into descendig order and start solving the questions?

Q.3 ***Subtract:***

$7a^4+3a^5-4a^3+9$ ***from*** $6a^5-3a^4-7a^3-8a-5$

Solution:

$$\begin{array}{l} 6a^5-3a^4-7a^3+8a-5 \\ \underline{-10a^5+7a^4-4a^3+9} \\ \underline{-4a^5-10a^4-3a^3+8a-9} \end{array}$$

Ans

Q.4 ***Subtract:***

$3x^4-2x^3-1+6x^2-$ ***from*** $4x^4+6x^2+8-3x^3-x$

Solution:

$$\begin{array}{l} 4x^4-3x^3+6x^2-x+8 \\ \underline{-3x^4+2x^3-6x^2+1} \\ \underline{x^4-x^3-\qquad\qquad -x+9} \end{array}$$

Ans

Q.5 ***Simplify:***

(i) $(2x+3y-4z)+(3y-6x+5z)+(x-y-z)$

Solution:

$$\begin{array}{r} 2x+3y-4z \\ -6x+3y+5z \\ \hline -3x+5y \end{array}$$ ***Ans***

(ii) $(6a-3b+4c+8d)-(3a+11b+3c+8d)$

Solution:

$$\begin{array}{r} 6a-3b+4c+8d \\ -3a+11b+3c+8d \\ \hline 3a-14b+5c \end{array}$$ ***Ans***

Q.6 ***If*** $A = 2x^3 - 4x^2 - 5$

$B = 4x^3 - 9x - 8x^2 + 3$

$C = 6x^2 - 3x^3 + 2 - 5x$

find the value of $A+B+C$

Solution:

$A+B+C$ (putting the values of A, B and C we get)

$= (2x^3-4x^2-5)+(4x^3-9x-8x^2+3)$

$+ (-6x^3-3x^3+2-5x)$

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

$= 3x^3-18x^2-14x$ ***Ans***

Q.7 ***Subtract:***

$4x^2y^2-7x^3y+4$ from the sum of

$2x^3y+6x^2y^2-7xy^3+8$ and $-8x^2y^2+6x^3y+8xy^3$

Solution:

$$\begin{array}{r} 3x^3y+6x^2y^2-7xy^3+8 \\ +\ 6x^3y-8x^2y^2+8xy^3 \quad (+) \\ \hline 9x^3y-2x^2y^2+xy^3+8 \\ -\ 7x^3y+4x^2y^2 \quad +8 \\ + \\ \hline 16x^3y-6x^2y^2+xy^3 \end{array}$$ ***Ans***

Q.8 ***Evaluate:***

$X+Y-Z$ When

$X = 8/5-3/3+6/2-1$

$Y = 7/4+8/3-6/5+2$

$Z = -3/5-2/3+4/4+8-2/2$

Solution:

$X+Y-Z$ (putting the values of X, Y and Z we get)

$= (8/^5-3/^3+6/^2-1)+(7/^4+8/^3-6/^5+2)$

$-(3/^5-2/^3+4/^4+8-2/^2)$

$= 8/^5-3/^3+6/^2-1+7/^4+8/^3-6/^5+2$

$-3/^5-2/^3+4/^4+8-2/^2$

$= 8/^5-6/^5+3/^5+7/^4-4/^4-3/^3+8/^3+2^3$

$+6/^2+2/^2-3+2-8$

$= 5/^5+3/^4+7/^3+8/^2-7.$ Ans

Q.9 ***Subtract*** $6a-9b+3c$ ***from the sum of*** $a+b-b$ ***and*** $-a+b-c$

Solution:

$$\begin{array}{r} c+b-c \\ -a+b-c \quad (+) \\ \hline 2b-2c \\ 6a-9b+3c \quad (-) \\ \hline -6a+11b-5c \end{array}$$

Ans

EXERCISE 7.2

Find the product of:

Q.1 $(x+3)(x+3)$

Solution:

$$x(x+3)+3(x+3)$$
$$= x^2+3x+3x+9$$
$$= x^2+6x+9 \quad \textbf{Ans}$$

Q.2 $(y+9)(y-9)$

Solution:

$$(y+9)(y-9)$$
$$= y(y-9)+9(y-9)$$
$$= y^2-9y+9y-81$$
$$= y^2-81 \quad \textbf{Ans}$$

Q.3 $(a+b)(a^2-ab+b^2)$

Solution:

$$(a+b)(a^2-ab+b^2)$$
$$= a^3-a^2b+ab^2+a^2b-ab^2+b^3$$
$$= a^3+b^3 \quad \textbf{Ans}$$

Q.4 $(2x-3y)(4x^2+9y^2+6xy)$

Solution:

$$(2x-3y)(4x^2+9y^2+6xy)$$
$$= 2x(4x^2+9y^2+6xy)-3y(4x^2+9y^2+6xy)$$
$$= 8x^3+18xy^2+12x^2y-12x^2y-27y^3-18xy^2$$
$$= 8x^3-27y^3 \quad \text{Ans}$$

Q.5 $(x+y-z)(x-y+z)$

Solution:

$$(x+y-z)(x-y+z)$$
$$= x(x-y+z)+y(x-y+z)-z(x-y+z)$$

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

$= x^2-y^2-z^2+2yz$ **Ans**

Q.6 $(l^2+l+1)(l^2-l+1)$

Solution:

$(l^2+1+1)(l^2-1+1)$

$= l^2(l^2-l+1)+l(l^2-l+1)+l(l^2-l+1)$

$= l^4-l^3+l^2+l^3-l^2+l+l^2-l+1$

$= l^4+l^2+1$ **Ans**

Q.7 $(5a-3+2a^2)(1-3a^2+2a^4-a)$

Solution:

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

$= 5a(1-3a^2+2a^4-a)-3(1-3a^2+2a^4-a)$

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

$= 5a-15a^3+10a^5-5a^2-3+9a^3-6a^4+3a+2a^2$

$-6a^4+4a^6-2a^3$

$= 4a^6+10a^5-12a^4-1a^3+6a^2+8a-3$ **Ans**

Q.8 $(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

Solution:

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

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

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

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

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

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

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

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

Q.9 ***If*** $A = 2p-3q-4r$ ***and*** $B = -4p+5p-2r$

Find the value of $3A - 4B$.

Solution:

$3A - 4B$

$3(2p-3q-4r)-4(-4q+5p-2r)$

(putting the value of A and B)

$= 6p-9q-12r+16q-20p+8r$

$= -14p+7q-4r$ ***Ans***

Q.10 Evaluate: $-3P+2Q-R$ ***when***

$P = -3x^3+4x^2-1$

$Q = -7x+2x^3-8$

$R = x^3-x^2+x-1$

Solution:

$-3P+2Q-R$

$=-3(-3x^3+4x^2-1)+2(-7x+2x^3-8)$

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

(by putting the value P, Q and R)

$= 9x^3-12x^2+3-14x+4x^3-16-x^3+x2-x+1$

$= 12x^3-11x^2-15x-12.$ ***Ans***

EXERCISE 7.3

Simplify:

Q.1 $25x^3y^4 \div 5xy^3$

Solution:

$$25x^3y^4 \div 5xy^3$$

$$= \frac{25x^3y^4}{5xy^3}$$

$$= \frac{5x^3y^4}{xy^3}$$

$$= 5x^{3-1}y^{4-3}$$

$$= 5x^2y \qquad \textbf{Ans}$$

Q.2 $(-121a^6b^3) \div (-11a^3b^3)$

Solution:

$$(-121a^6b^3) \div (-11a^3b^3)$$

$$= \frac{-121a^6b^3}{-11a^3b^3}$$

$$= \frac{11a^6b^3}{a^3b^3}$$

$$= 11a^{6-3}b^{3-3}$$

$$= 11a^3 \qquad \textbf{Ans}$$

Q.3 $(16^6y^5z - 48^7y^6z - 144y^3z^4) \div (8y^2z^4)$

Solution:

$$(16y^5z - 48^7y^6z - 144y^3z^4) \div (8y^2z^4)$$

$$= \frac{16y^5x^5}{8y^2z^4} - \frac{48y^7z^4}{8y^2z^4} - \frac{144y^3z^4}{8y^2z^4}$$

$$= 2y^{8-2}z^{5-4} - 6y^{7-2}z^{6-4} - 18y^{3-2}z^{4-4}$$

$$= 2y^6z - 6y^5z^2 - 18y \qquad \textbf{Ans}$$

Q.4 $(x^2-5x-6)\div(x-2)$

Solution:

$(x^2-5x-6)\div(x-2)$

$x-2\overline{)x^2-5x-6}\,(x-3$

x^2-2x

$-\quad +$

$-3x-6$

$-3x-6$

$+\quad +$

$x-3$

Ans

Q.5 $(x^4-y^4)\div(x-y)$

Solution:

$(x^4-y^4)\div(x-y)$

$x-y)x^4-y^4\ (x^3+x^2y+xy^2+y^3$

x^4-x^3y

$-\quad +$

x^3y-y^4

$x^3y-x^2y^2$

$-\quad +$

$x^2y^2-y^4$

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

$-\quad +$

xy^3-y^4

xy^3-y^4

$-\quad +$

Answers:

$x^3+x^2y+xy^2+y^3$ *or* $(x^2+y^2)(x+3)$

Q.6 $(6x^2-2x-x^4-4x^3+x^5)\div(x^3-4x+2)$

Solution:

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

Writing the expression in descending order,

we get

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

$x^3-4x+2\overline{)x^5-x^4-4x^3+6x^2-2x}\,(x^2-x$

$-x^5 \quad +4x^3-2x^2$

$-x^4+4x^2-2x$

$-x^4+4x^2-2x$

$+\ -\ +$

x^2-x **Ans**

Q.7 $(x^3-64)\div(x^2+4x+16)$

Solution:

$(x^3-64)\div(x^2+4x+16)$

$x^2-4x+16\overline{)x^3-64}\,(x-4$

x^3+4x^2+16

$-4x^2-16x-64$

$-4x^2-16x-64$

$+\ -\ +$

$x-4$ **Ans**

Q.8 $(-16x^4+1)\div(4x^2-1)$

Solution:

$(-16x^4+1)\div(4x^2-1)$

$4x^2-1\overline{)-16x^4+1}\,(-4x^2-1$

$-16x^4+4x^2$

$-4x^2+1$

$-4x^2+1$

$-\ +$

$-4x^2+1$ **Ans**

Q.9 $(2-4y^2+12y^4+7y-17y^3)\div(2y+1-3y^2)$

Solution:

$(24-y^2+12y^4+7y-17y^3)\div(2y+1-3y^2)$

Putting the expression is descending order, we get

$(12y^4-17y^3-4y^2+7y+2)\div(-3y^2+2y+1)$

$-3y^2+2y+1\overline{)12y^4-17y^3-4y^2+7y+2}\,(-4y^2+3y+2$

$-12y^4-8y^3-4y^2$

$-9y^3+7y+2$

$-9y^3+3y+6y^2$

$-6y^2+4y+2$

$-6y^2+2y+2$

$-4y^2+3y+2$

Ans

Q.10 $(a^3+b^3+c^3-3abc)\div(a+b+c)$

Solution:

$(a^3+b^3+c^3-3abc)\div(a+b+c)$

$a+b+c\overline{)a^3+b^3+c^3-3abc}\,(a^2-ab+b^2-ac+c^2-bc$

$a^3+a^2y+a^2c$

$a^2b-a^2c+b^3+c^3-3abc$

$-a^2b-ab^2\quad -abc$

$+ab^2+a^2c+b^3+c^3-2abc$

$+ab^2\quad +b^3+b^2c$

$-a^2c-b^2c+c^3-2abc$

$-a^2c-ac^2\quad -abc$

$ac^2-b^2c+c^3-abc$
$ac^2-bc^2+c^3$
$- \quad - \quad -$
$-abc-b^2c-bc^2$
$-abc-bc^2-bc^2$
$+ \quad + \quad +$
$a^2+b^2+c^2-ab-bc-ca$ **Ans**

Q.11 $x^6+4x^5-16x^3+x+2x^2+3-3x^4$ **by** x^3+4x^2+1+2x

Solution:

$x^6+4x^5-16x^3+x+2x^2+3-3x^4$

by x^3+4x^2+1+2x

Writing the expression is descending order, we get

$(x^6+4x^5-3x^4-16x^3+2x^2+x+3)\div(x^3+4x^2+2x+1)$

$x^3+4x^2+2x+1)\overline{x^6+4x^5-3x^4-16x^3+2x^2+x+3}(x^3-5x+3$

$x^6+4x^5+2x^4-x^3$
$- \quad - \quad - \quad -$
$-5x^4-17x^3+2x^2+x+3$
$-5x^4-20x^3-10x^2-5x$
$+ \quad + \quad + \quad +$
$3x^3+12x^2+6x+3$
$3x^3+12x^2+6x+3$
$- \quad - \quad -$
x^2-5x+3 **Ans**

Q.12 ***For what value of q is the expression $5x^3-14x+q$ exactly divisible by $x-2$?***

Solution:

$x-2)\overline{5x^3-14x+q}(5x^2+10x+6$
$-5x^3-10x^2$
$+$
$10x^2-14x+q$

$$10x^2-20x$$
$$- \quad -$$
$$6x+q$$
$$-6x-12$$
$$+$$
$$q+12 \quad \textit{Ans}$$

Since remainder must be equal to zero.

So $q+12=0$

or $q+12-12=0-12$

or $q=-12$ ***Ans***

