CHAPTER 2

Polynomials

1. OBJECTIVE QUESTIONS

1. Factors of $x^4 - x^2 - 12$ are
(a) $(x+2),(x-2),(x^2+3)$
(b) $(x+3),(x-3),(x^2+2)$
(c) $(x+2),(x-2),(x^2-3)$
(d) $(x^2+2),(x^2-6)$

Ans : (a) $(x+2),(x-2),(x^2+3)$

We can find two numbers p and q such that $q+p=-1$ and $pq=-12$.
The numbers are -4 and 3.

$$\begin{aligned} x^4 - x^2 - 12 &= x^4 - 4x^2 + 3x^2 - 12 \\ &= x^2(x^2-4) + 3(x^2-4) \\ &= (x^2-4)(x^2+3) = (x+2)(x-2)(x^2+3) \end{aligned}$$

2. If $\left(x - \frac{1}{x}\right)^2 = x^2 + y + \frac{1}{x^2}$, then the value of y is
(a) -2 (b) 2
(c) $2x$ (d) $-2x$

Ans : (a) -2

3. $x^2 + (a+b+c)x + ab + bc =$
(a) $(x+a)(x+b+c)$ (b) $(x+a)(x+a+c)$
(c) $(x+b)(x+a+c)$ (d) $(x+b)(x+b+c)$

Ans : (c) $(x+b)(x+a+c)$

$$\begin{aligned} x^2 + (a+b+c)x + ab + bc &= x^2 + (a+c)x + bx + b(a+c) \\ &= x^2 + bx + (a+c)(x+b) \\ &= x(x+b) + (a+c)(x+b) \\ &= (x+b)(x+a+c) \end{aligned}$$

4. Factorisation of $a^{2x} - b^{2x}$ is
(a) $(a^x + b^x)(a^x - b^x)$ (b) $(a^x - b^x)^2$
(c) $(a^x + b^x)(a^2 - b^2)$ (d) $(a^x - b^x)(a^2 + b^2)$

Ans : (a) $(a^x + b^x)(a^x - b^x)$

$$a^{2x} - b^{2x} = (a^x)^2 - (b^x)^2 = (a^x + b^x)(a^x - b^x)$$

5. Which one of the following algebraic expressions is a polynomial in variable x?
(a) $x^2 + \frac{2}{x^2}$ (b) $\sqrt{x} + \frac{1}{\sqrt{x}}$
(c) $x^2 + \frac{3x^{3/2}}{\sqrt{x}}$ (d) None of these

Ans : (c) $x^2 + \frac{3x^{3/2}}{\sqrt{x}}$

$x^2 + \frac{3x^{3/2}}{\sqrt{x}}$ can be written as $x^2 + 3x$, which is a polynomial in x.

6. If one factor of $5 + 8x - 4x^2$ is $(2x+1)$, then the second factor is
(a) $(5+2x)$ (b) $(2x-5)$
(c) $(5-2x)$ (d) $-(5+2x)$

Ans : (c) $(5-2x)$

7. Degree of the polynomial $p(x) = 3x^4 + 6x + 7$ is
(a) 4 (b) 5
(c) 3 (d) 1

Ans : (a) 4

The highest power of the variable x is 4. So, the degree of the polynomial is 4.

8. If one factor of $a(x+y+z) + bx + by + bz$ is $(x+y+z)$, then the second factor is
(a) $ax + ay + az$ (b) $bx + by + bz$
(c) $bx + by - bz$ (d) $a + b$

Ans : (d) $a + b$

9. Degree of the polynomial $p(x) = (x+2)(x-2)$ is
(a) 2 (b) 1
(c) 0 (d) 3

Ans : (a) 2

$$p(x) = (x+2)(x-2) = x^2 - 4$$

The highest power of the variable x is 2. So the degree of the polynomial, $p(x) = 2$

10. If $8x^4 - 8x^2 + 7$ is divided by $2x+1$, the remainder is
(a) $\frac{11}{2}$ (b) $\frac{13}{2}$
(c) $\frac{15}{2}$ (d) $\frac{17}{2}$

Ans : (a) $\frac{11}{2}$

Let, $p(x) = 8x^4 - 8x^2 + 7$
So, the remainder when $p(x)$ is divided by $2x+1$ is

$$p\left(-\frac{1}{2}\right) = 8\left(\frac{-1}{2}\right)^4 - 8\left(\frac{-1}{2}\right)^2 + 7 = \frac{11}{2}$$

11. If $a+b+c=0$, then $a^3 + b^3 + c^3 =$
(a) abc (b) $3abc$
(c) $2abc$ (d) $-3abc$

Ans : (b) $3abc$

We know that,

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

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

If $a+b+c=0$, then $a^3+b^3+c^3=3abc$.

12. For the polynomial $p(x)=x^5+4x^3-5x^2+x-1$, one of the factors is

(a) $(x+1)$ (b) $(x-1)$

(c) x (d) $(x+2)$

Ans : (b) $(x-1)$

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

$$p(1)=1+4-5+1-1=0$$

Hence, $x=1$ is the solution of $p(x)$.

13. In the method of factorisation of an algebraic expression, which of the following statement is false?

(a) Taking out a common factor from two or more terms.

(b) Taking out a common factor from a group of terms.

(c) Using remainder theorem.

(d) Using standard identities.

Ans : (c) Using remainder theorem.

Remainder theorem is not used for factorisation of an algebraic expression.

14. If $x=2$, $y=-1$, then the value of $x^2+4xy+4y^2$ is

(a) 0 (b) 1

(c) -1 (d) 2

Ans : (a) 0

15. Factorisation of $a^2+b^2+2(ab+bc+ca)$ is

(a) $(a+b)(a+b+2c)$ (b) $(b+c)(c+a+2b)$

(c) $(c+a)(a+b+2c)$ (d) $(b+a)(b+c+2a)$

Ans : (a) $(a+b)(a+b+2c)$

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

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

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

16. Factors of

$36+11\left(z-\frac{y}{3}+x\right)-12\left(z-\frac{y}{3}+x\right)^2$

$+\left(4z-\frac{4}{3}y+4x-9\right)(5+3z-y+2x)$ are

(a) $(1-x)\left(4z-\frac{4y}{3}+4x-9\right)$

(b) $(1+x)\left(4z-\frac{4y}{3}+4x-9\right)$

(c) $(1-x)\left(4z+\frac{4y}{3}+4x-9\right)$

(d) $(1+x)\left(4z+\frac{4y}{3}+4x+9\right)$

Ans : (a) $(1-x)\left(4z-\frac{4y}{3}+4x-9\right)$

17. If $x=-2$ and $x^2+y^2+3xy=-5$, then find

(a) -2 (b) 3

(c) -4 (d) 9

Ans : (b) 3

Value of $x^2+y^2+3xy=-5$ and $x=-2$

$(-2)^2+y^2-6y=-5$

$y^2-6y+9=0$

$(y-3)^2=0$

$y-3=0$

$y=3$

18. Expansion of $\left(x+\frac{1}{x}\right)^2$ is

(a) $x^2+2x+\frac{1}{x^2}$ (b) $x^2-2x+\frac{1}{x^2}$

(c) $x^2+2+\frac{1}{x^2}$ (d) $x^2-2+\frac{1}{x^2}$

Ans : (c) $x^2+2+\frac{1}{x^2}$

19. Factors of polynomial $x^3-3x^2-10x+24$ are

(a) $(x-2)(x+3)(x-4)$ (b) $(x+2)(x+3)(x+4)$

(c) $(x+2)(x-3)(x-4)$ (d) $(x-2)(x-3)(x-4)$

Ans : (a) $(x-2)(x+3)(x-4)$

20. If $x+\frac{1}{x}=5$, then find the value of $x^2+\frac{1}{x^2}$

(a) 26 (b) 23

(c) 30 (d) 22

Ans : (b) 23

$$x+\frac{1}{x}=5$$

$$\left(x+\frac{1}{x}\right)^2=(5)^2$$

$$x^2+2(x)\left(\frac{1}{x}\right)+\left(\frac{1}{x}\right)^2=25$$

$$x^2+2+\frac{1}{x^2}=25$$

or $$x^2+\frac{1}{x^2}=23$$

21. Factorisation of $x^2+3\sqrt{2}\,x+4$ is

(a) $(x+2\sqrt{2})(x+\sqrt{2})$ (b) $(x+2\sqrt{2})(x-\sqrt{2})$

(c) $(x-2\sqrt{2})(x+\sqrt{2})$ (d) $(x-2\sqrt{2})(x-\sqrt{2})$

Ans : (a) $(x+2\sqrt{2})(x+\sqrt{2})$

$x^2+3\sqrt{2}\,x+4=x^2+2\sqrt{2}\,x+\sqrt{2}\,x+4$

$=x(x+2\sqrt{2})+\sqrt{2}(x+2\sqrt{2})$

$=(x+2\sqrt{2})(x+\sqrt{2})$

22. The values of a and b so that the polynomial $x^3-ax^2-13x+b$ is divisible by $(x+1)$ and $(x-3)$ are

(a) $a=15, b=3$ (b) $a=0, b=-12$

(c) $a=-3, b=15$ (d) $a=-12, b=0$

Ans : (b) $a=0, b=-12$

23. Factorisation of $x^2-1-2a-a^2$ is
(a) $(x-a-1)(x+a-1)$ (b) $(x+a+1)(x-a-1)$
(c) $(x+a+1)(x-a+1)$ (d) $(x-a+1)(x+a-1)$

Ans : (b) $(x+a+1)(x-a-1)$

$$\begin{aligned} x^2-1-2a-a^2 &= x^2-(1+2a+a^2) \\ &= x^2-(a+1)^2 \\ &= (x+a+1)(x-a-1) \end{aligned}$$

24. Factors of $a^2-b+ab-a$ are
(a) $(a-b)(a+1)$ (b) $(a+b)(a-1)$
(c) $(a-b)(a-1)$ (d) $(a+b)(a+1)$

Ans : (b) $(a+b)(a-1)$

25. Which of the following algebraic expressions is not a polynomial ?
(a) $\frac{17}{2}x^2+x-3$ (b) $\sqrt{7}\,x^3+3x^{2/3}-8$
(c) 3 (d) 0

Ans : (b) $\sqrt{7}\,x^3+3x^{2/3}-8$

The expression $\sqrt{7}\,x^3+3x^{2/3}-8$ is not a polynomial as second term has fractional exponent $= 2/3$

26. Factors of $(42-x-x^2)$ are
(a) $(x-7),(x-6)$ (b) $(x+7),(x-6)$
(c) $(x+7),(6-x)$ (d) $(x-7),(x+6)$

Ans : (c) $(x+7),(6-x)$

$$\begin{aligned} 42-x-x^2 &= 42-7x+6x-x^2 \\ &= 7(6-x)+x(6-x) \\ &= (6-x)(7+x) \end{aligned}$$

27. The polynomials ax^2+3x^2-3 and $2x^3-5x+a$ when divided by $(x-4)$ leaves remainders R_1 and R_2 respectively, then value of a if $2R_1-R_2=0$, is
(a) $-\frac{18}{127}$ (b) $\frac{18}{32}$
(c) $\frac{17}{127}$ (d) $-\frac{17}{31}$

Ans : (b) $\frac{18}{32}$

28. Factors of $(a+b)^3-(a-b)^3$ are
(a) $2ab,(3a^2+b^2)$ (b) $ab,(3a^2+b^2)$
(c) $2b,(3a^2+b^2)$ (d) $(3a^2+b^2),2a$

Ans : (c) $2b,(3a^2+b^2)$

$$\begin{aligned} &(a+b)^3-(a-b)^3 \\ &= \big[(a+b)-(a-b)\big]\big[(a+b)^2+(a+b)(a-b)+(a-b)^2\big] \\ &= 2b\big[a^2+2ab+b^2+a^2-b^2+a^2-2ab+b^2\big] \\ &= 2b\big[3a^2+b^2\big] \end{aligned}$$

29. If $x^2-x-42=(x+k)(x+6)$, then the value of k is
(a) 6 (b) -6
(c) 7 (d) -7

Ans : (d) -7

30. The common quantity that must be added to each term of $a^2:b^2$ to make it equal to $a:b$ is
(a) ab (b) $a+b$
(c) $a-b$ (d) $\frac{a}{b}$

Ans : (a) ab

Consider $a^2:b^2$,
Adding ab on both sides, we get

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

31. Factors of $x^2-7x+12$ are
(a) $(x-3)(x+4)$ (b) $(x-3)(x-4)$
(c) $(x+3)(x-4)$ (d) $(x+3)(x+4)$

Ans : (b) $(x-3)(x-4)$

32. One of the dimensions of the cuboid whose volume is $16x^2-26x+10$ is
(a) 2 (b) $(8x-5)$
(c) $(x-1)$ (d) All of these

Ans : (d) All of these

$$\begin{aligned} 16x^2-26x+10 &= 2(8x^2-13x+5) \\ &= 2(8x^2-8x-5x+5) \\ &= 2(8x-5)(x-1) \end{aligned}$$

33. Find the value of $x+y+z$ if $x^2+y^2+z^2=18$ and $xy+yz+zx=9$
(a) 9 (b) 3
(c) 6 (d) 8

Ans : (c) 6

$$\begin{aligned} (x+y+z)^2 &= x^2+y^2+z^2+2xy+2yz+2zx \\ &= 18+2(9) = 36 \\ x+y+z &= 6 \end{aligned}$$

34. Find the remainder when the polynomial $f(x) = x^3-3x^2+4x+50$ is divided by $x+3$
(a) -16 (b) -12
(c) -20 (d) -10

Ans : (a) -16

$x=-3$ is the zero of $x+3$.
By the remainder theorem, we know that when $f(x)$ is divided by $(x+3)$, the remainder is $f(-3)$.

$$\begin{aligned} \text{Now, } f(-3) &= \big[(-3)^3-3\times(-3)^2+4\times(-3)+50\big] \\ &= (-27-27-12+50) = -16 \end{aligned}$$

35. If $2x^2+xy-3y^2+x+ay-10=(2x+3y+b)(x-y-2)$, then the values of a and b are
(a) 11 and 5 (b) 1 and -5
(c) -1 and -5 (d) -11 and 5

Ans : (d) -11 and 5

36. The value of a for which $(x+a)$ is a factor of the polynomial $x^3+ax^2-2x+a+6$ is

(a) 4 (b) 2

(c) -4 (d) -2

Ans : (d) -2

$(x+a)$ is a factor of

$$f(x) = x^3+ax^2-2x+a+6$$

$$f(-a) = 0 \qquad [x+a=0 \Rightarrow x=-a]$$

$$(-a)^3+a(-a)^2-2(-a)+a+6 = 0$$

$$3a = -6$$

$$a = -2$$

37. Factorisation of the polynomial $\sqrt{3}\,x^2+11x+6\sqrt{3}$ is

(a) $(\sqrt{3}\,x+2)(x-3\sqrt{3})$ (b) $(\sqrt{3}\,x+2)(x+3\sqrt{3})$

(c) $(\sqrt{2}\,x+3)(x+2\sqrt{3})$ (d) $(\sqrt{2}\,x-2)(x+3\sqrt{2})$

Ans : (b) $(\sqrt{3}\,x+2)(x+3\sqrt{3})$

$$\sqrt{3}\,x^2+11x+6\sqrt{3} = \sqrt{3}\,x^2+9x+2x+6\sqrt{3}$$

$$= \sqrt{3}\,x(x+3\sqrt{3})+2(x+3\sqrt{3})$$

$$= (\sqrt{3}\,x+2)(x+3\sqrt{3})$$

38. Find the value of $x^3-8y^3-36xy-216$, when $x=2y+6$

(a) -1 (b) 2

(c) 0 (d) 3

Ans : (c) 0

We have, $x^3-8y^3-36xy-216$

$$= x^3+(-2y)^3+(-6)^3-3(x)(-2y)(-6)$$

$$= (x-2y-6)(x^2+4y^2+36+2xy-12y+6x)$$

$$= 0\times(x^2+4y^2+36+2xy-12y+6x) = 0$$

$$(x=2y+6 \Rightarrow x-2y-6=0)$$

2. FILL IN THE BLANK

DIRECTION : Complete the following statements with an appropriate word/term to be filled in the blank space(s).

1. $x-a$ is a factor of the polynomial $p(x)$, if $p(a) =$ .....

Ans : 0

2. The degree of the polynomial $7x^3y^{10}z^2$ is .....

Ans : 15

3. Factors of x^6-y^6 is .....

Ans : $(x-y)(x+y)(x^2+y^2-xy)(x^2+y^2+xy)$

4. A polynomial of degree one is called a ..... polynomial.

Ans : linear

5. A polynomial of degree three is called a ..... polynomial.

Ans : cubic

6. The factors of $a^3+b^3+x^3-3abc$ are .....

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

7. A polynomial of one term is called a .....

Ans : monomial

8. The quotient of $8x^3-7x^2+5x$ when divided by $2x$ is .....

Ans : $4x^2-\frac{7}{2}x+\frac{5}{2}$

9. A polynomial of three terms is called a .....

Ans : trinomial

10. The remainder obtained when $80x^3+55x^2+20x+172$ is divided by $x+2$ is .....

Ans : -288

11. $11x^2-88x^3+14x^4$ is called a ..... polynomial.

Ans : biquadratic

12. If $a+b+c=0$, then $a^3+b^3+c^3=$ .....

Ans : $a^3+b^3+c^3=3abc$

3. TRUE/FALSE

DIRECTION : Read the following statements and write your answer as true or false.

1. The number of zeroes of a polynomial is the degree of the polynomial.

Ans : True

2. $5x^3-4x^2+2x+3$ is a polynomial over integers.

Ans : True

3. A polynomial may have more than one zero.

Ans : True

4. $3x^2-5x+6$ is a polynomial of degree 2.

Ans : True

5. $\sqrt{3}\,x^2+11x+6\sqrt{3} = (x+3\sqrt{3})(\sqrt{3}\,x+2)$

Ans : True

6. $7x^3-3x^2+\sqrt{2}\,x+5$ is a polynomial.

Ans : True

7. Every polynomial is a binomial.

Ans : False

8. When x^3-6x^2+9x+7 is divided by $(x-1)$ remainder is 11.
Ans : True

9. Every binomial is a polynomial of degree 2.
Ans : False

10. The degree of a constant polynomial is 1.
Ans : False

4. MATCHING QUESTIONS

DIRECTION : In the section, each question has two matching lists. Choices for the correct combination of elements from Column-I and Column-II are given as options (a), (b), (c) and (d) out of which one is correct.

1. Column-II shows the degree of polynomials given Column-I

Column-I		Column-II	
(P)	$2-y^2-y^3+2y^8$	(1)	2
(Q)	2	(2)	1
(R)	$5x-\sqrt{7}$	(3)	0
(S)	$4-x^2$	(4)	8

	P	Q	R	S
(a)	1	3	2	4
(b)	4	3	2	1
(c)	4	2	3	1
(d)	2	3	4	1

Ans : P − 4, Q − 3, R − 2, S − 1

(P) The highest power of the variable is 8. So, the degree of the polynomial is 8.
(Q) The only term here is 2 which can be written as $2x^0$. So, the exponent of x is 0. Therefore, the degree of the polynomial is 0.
(R) The highest power of the variable is 1. So, the degree of the polynomial is 1.
(S) The highest power of the variable is 2. So, the degree of the polynomial is 2.

2. Column-II gives factors for expression given in Column-I.

	Column-I		Column-II
(P)	$9x^2+6xy+y^2$	(1)	$(2x+3y-4z)$ $(2x+3y-4z)$
(Q)	$4x^2+9y^2+16z^2+12xy$ $-24yz-16xz$	(2)	$\left(x+\frac{y}{10}\right)\left(x-\frac{y}{10}\right)$
(R)	$27x^3+y^3+z^3-9xyz$	(3)	$(3x+y+z)(9x^2+y^2$ $+z^2-3xy-yz-3zx)$
(S)	$x^2-\frac{y^2}{100}$	(4)	$(3x+y)(3x+y)$

Ans : P − 4, Q − 1, R − 3, S − 2

3. Column-II gives value of k for polynomials given in Column-I when it is completely divisible by $x-1$.

Column-I		Column-II	
(P)	$kx^2-3x-2k$	(1)	0
(Q)	x^2-x+k	(2)	-3
(R)	$2x^2+kx+3$	(3)	$(\sqrt{2}-1)/3$
(S)	$3kx^2-\sqrt{2}\,x+1$	(4)	-5

	P	Q	R	S
(a)	2	1	4	3
(b)	4	1	3	2
(c)	1	4	3	2
(d)	3	2	4	1

Ans : P − 2, Q − 1, R − 4, S − 3

(P) $p(x) = kx^2-3x-2k$
$p(1) = k(1)^2-3(1)-2k$
$= k-3-2k = -k-3$
Now, $p(1) = 0 \Rightarrow -(k+3)=0$
$k = -3$
(Q) $p(x) = x^2-x+k$
$p(1) = 1-1+k \Rightarrow p(1)=k$
Now, $p(1) = 0 \Rightarrow k=0$
(R) $p(x) = 2x^2+kx+3$
$p(1) = 2(1)^2+k(1)+3 = 2+k+3 = k+5$
Now, $p(1) = 0$
$k+5 = 0 \Rightarrow k=-5$
(S) $p(x) = 3kx^2-\sqrt{2}\,x+1$
$p(1) = 3k(1)^2-\sqrt{2}(1)+1 = 3k-\sqrt{2}+1$
Now, $p(1) = 0, \Rightarrow 3k-\sqrt{2}+1=0$
$k = \frac{\sqrt{2}-1}{3}$

4. Column-II gives remainder when x^3+3x^2+3x+1 is divided by expression given in Column-I.

	Column-I		Column-II
(P)	$x+1$	(1)	27/8
(Q)	x	(2)	$-27/8$
(R)	$x-\frac{1}{2}$	(3)	1
(S)	$5+2x$	(4)	0

Ans : P − 4, Q − 3, R − 1, S − 2

5. Column-II gives value of the polynomials given in Column-I at the given points.

Column-I		Column-II	
(P)	$3t^2-2t^2+t$ at $t=1/2$	(1)	2
(Q)	$3x^3+x^2-20x+12$ at $x=2/3$	(2)	-1
(R)	$7u^5-4u^3+2$ at $u=0$	(3)	3/8
(S)	$(3x-1)(2s-3)$ at $s=1/2$	(4)	0

	P	Q	R	S
(a)	1	2	3	4
(b)	4	2	1	3
(c)	4	3	2	1
(d)	3	4	1	2

Ans : P − 3, Q − 4, R − 1, S − 2

(P) $p(t)=3t^3-2t^2+t$

$p\left(\frac{1}{2}\right)=3\left(\frac{1}{2}\right)^3-2\left(\frac{1}{2}\right)^2+\frac{1}{2}$

$p\left(\frac{1}{2}\right)=\frac{3}{8}-\frac{1}{2}+\frac{1}{2}=\frac{3}{8}$

(Q) $p(x)=3x^3+x^2-20x+12$

$p\left(\frac{2}{3}\right)=3\left(\frac{2}{3}\right)^2+\left(\frac{2}{3}\right)^2-20\left(\frac{2}{3}\right)+12$

$p\left(\frac{2}{3}\right)=\frac{8}{9}+\frac{4}{9}-\frac{40}{3}+12$

$p\left(\frac{2}{3}\right)=\frac{8+4-120+108}{9}=0$

(R) $p(u)=7u^5-4u^3+2$

$p(0)=2$

(S) $p(s)=(3s-1)(2s-3)$

$p\left(\frac{1}{2}\right)=\left[3\left(\frac{1}{2}\right)-1\right]\left[2\left(\frac{1}{2}\right)-3\right]$

$=\left(\frac{3}{2}-1\right)(1-3)=\frac{1}{2}(-2)=-1$

6. Column-II gives value of k for polynomials given in Column-I when it is divided by $x-1$.

	Column-I		Column-II
(P)	kx^2-3x+k	(1)	-2
(Q)	x^2+x+k	(2)	3/2
(R)	$2x^2+kx+\sqrt{2}$	(3)	$\sqrt{2}-1$
(S)	$kx^2-\sqrt{2}\,x+1$	(4)	$-(2+\sqrt{2})$

Ans : P − 2, Q − 1, R − 4, S − 3

5. ASSERTION AND REASON

DIRECTION : In each of the following questions, a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Assertion is false but reason is true.

1. **Assertion :** If $f(x)=3x^7-4x^6+x+9$ is a polynomial, then its degree is 7.
Reason : Degree of a polynomial is the highest power of the variable in it.
Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

2. **Assertion :** $(x+2)$ and $(x-1)$ are factors of the polynomial $x^4+x^3+2x^2+4x-8$.
Reason : For a polynomial $p(x)$ of degree≥ 1, $x-a$ is a factor of the polynomial $p(x)$ if and only if $p(a)\geq 1$.
Ans : (c) Assertion is true but reason is false.

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

$p(-2)=(-2)^4+(-2)^3+2(-2)^2+4(-2)-8$

$=16-8+8-8-8=0$

So, $(x+2)$ is a factor of $p(x)$.

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

$=1+1+2+4-8=0$

$(x-1)$ is a factor of $p(x)$.

3. **Assertion :** $3x^2+x-1=(x+1)(3x-2)+1$.
Reason : If $p(x)$ and $g(x)$ are two polynomials such that degree of $p(x)\geq$ degree of $g(x)$ and $g(x)\geq 0$ then we can find polynomials $q(x)$ and $r(x)$ such that $p(x)=g(x)\ q(x)+r(x)$, where $r(x)=0$ of degree of $r(x)<$degree of $g(x)$.
Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

4. **Assertion :** The expression $3x^4-4x^{3/2}+x^2=2$ is not a polynomial because the term $-4x^{3/2}$ contains a rational power of x.
Reason : The highest exponent in various terms of an algebraic expression in one variable is called its degree.
Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

5. **Assertion :** $(x+2)$ is a factor of x^3+3x^2+5x+6 and of $2x+4$.
Reason : If $p(x)$ be a polynomial of degree greater than or equal to one, then $(x-a)$ is a factor of $p(x)$, if $p(a)=0$
Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

6. **Assertion :** The remainder when $p(x)$

$= x^3 - 6x^2 + 2x - 4$ is divided by $(3x - 1)$ is $\frac{-107}{27}$.

Reason : If a polynomial $p(x)$ is divided by $ax - b$, the remainder is the value of $p(x)$ at $x = \frac{b}{a}$.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

$$p(x) = x^3 - 6x^2 + 2x - 4$$
$$p\left(\frac{1}{3}\right) = \left(\frac{1}{3}\right)^3 - 6\left(\frac{1}{3}\right)^2 + 2\left(\frac{1}{3}\right) - 4$$
$$= \frac{1}{27} - \frac{6}{9} + \frac{2}{3} - 4 = \frac{1}{27} - 4$$
$$= \frac{1 - 4 \times 27}{27} = \frac{-107}{27}$$

7. **Assertion :** If $(x + 1)$ is a factor of $f(x) = x^2 + ax + 2$, then $a = -3$.
Reason : If $(x - a)$ is a factor of $p(x)$, if $p(a) = 0$.
Ans : (d) Assertion is incorrect but Reason is correct.

8. **Assertion :** If $f(x) = x^4 + x^3 - 2x^2 + x + 1$ is divided by $(x - 1)$, then its remainder is 2.
Reason : If $p(x)$ be a polynomial of degree greater than or equal to one, divided by the linear polynomial $x - a$, then the remainder is $p(-a)$.
Ans : (c) Assertion is correct but Reason is incorrect.

9. **Assertion :** The degree of the polynomial $(x - 2)(x - 3)(x + 4)$ is 4.
Reason : The number of zeroes of a polynomial is the degree of that polynomial.
Ans : (d) Assertion is false but reason is true.

$$p(x) = (x - 2)(x - 3)(x + 4)$$
$$= (x - 2)[x^2 + 4x - 3x - 12]$$
$$= (x - 2)(x^2 + x - 12)$$
$$= x^3 + x^2 - 12x - 2x^2 - 2x + 24$$
$$p(x) = x^3 - x^2 - 14x + 24$$

So, degree of $p(x) = 3$

10. **Assertion :** If $p(x) = ax + b$, $a \neq 0$ is a linear polynomial, then $x = \frac{-b}{a}$ is the only zero of $p(x)$.
Reason : A linear polynomial has one and only one zero.
Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.