CBSE Test Paper 03
CH-2 Polynomials

---

1. The degree of the polynomial $(x^3 - 2)(x^2 - 11)$ is
   a. 0
   b. 5
   c. 3
   d. 2
2. A polynomial of degree 3 in x has at most
   a. 3 terms
   b. 1 term
   c. 5 terms
   d. 4 terms
3. If (x+1) and (x-1) are factors of $px^3 + x^2 - 2x + q$ then value of p and q are
   a. p = -1, q = 2
   b. p = 2, q = -1
   c. p = 2, q = 1
   d. p = -2, q = -2
4. If $P(x) = x^3 - 1$, then the value of P(1) + P(-1) is
   a. 2
   b. 1
   c. – 2

d. 0

5. One of the zeroes of the polynomial 2 x^2 + 7x – 4 is

a. -2

b. $\frac{1}{2}$

c. $\frac{-1}{2}$

d. 2

6. Fill in the blanks:

Degree of the polynomial $4x^4 + 0x^3 + 0x^5 + 5x + 7$ is _________ .

7. Fill in the blanks:

If p(x) = $x^2 - 2\sqrt{2}x + 1$, then $p\left(2\sqrt{2}\right)$ is equal to ________.

8. Is $\sqrt{3}x^2 - 2x$ a polynomial? Justify your answer.

9. Evaluate the following: $104^3 + 96^3$

10. Simplify the following products: $(\frac{1}{2}a - 3b)(3b + \frac{1}{2}a)(\frac{1}{4}a^2 + 9b^2)$

11. Factorise $25x^2 + 4y^2 + 9z^2 - 20xy - 12yz + 30zx$ by using suitable identity.

12. If $x = \frac{3}{2}$ is a zero of the polynomial $2x^2 + kx - 12$, find the value of k.

13. If a + b + c = 9 and $a^2 + b^2 + c^2 = 35$, find the value of $a^3 + b^3 + c^3 - 3abc$.

14. Find the remainder when the polynomial $f(x) = 2x^4 - 6x^3 + 2x^2 - x + 2$ is divided by x + 2

15. What must be subtracted from $4x^4 - 2x^3 - 6x^2 + x - 5$ so that the result is exactly divisible by $2x^2 + x - 1$?

CBSE Test Paper 03
CH-2 Polynomials

Solution

1. (b) 5

   Explanation:

   $(x^3 - 2)(x^2 - 11)$

   = $x^3\left(x^2 - 11\right) - 2\left(x^2 - 11\right)$

   = $x^5 - 11x^3 - 2x^2 + 22$

   Here the highest power is 5.

   Therefore, the degree is 5.

2. (a) 3 terms

   Explanation: 3 terms of not more than the power of 3
3. (b) p = 2, q = -1

   Explanation:

   Given : f(x) = $px^3 + x^2 - 2x + q$

   If x + 1 is a factor of f(x). Then

   f(-1) = 0

   $p(-1)^3 + (-1)^2 - 2(-1) + q = 0$

   -p + 1 + 2 + q = 0

   -p + q = -3

   p - q = 3.   ....(i)

   Also, if x - 1 is a factor of f(x), then

$p(1)^3 + (1)^2 - 2(1) + q = 0$

p + 1 - 2 + q = 0

p + q = 1. ....(ii)

Adding eq.(i) and (ii), we get

2p = 4

p = 2

Subtracting eq.(ii) from eq.(i), we get

-2q = 2

q = -1

Therefore, p = 2, q = -1

4. (c) – 2

Explanation:

$P(x) = x^3 - 1,$

then the value of P(1) + P(-1)

= $(1)^3 - 1 + (-1)^3 - 1$

= 1 - 1 - 1 - 1 = 1 - 3 = – 2

5. (b) $\frac{1}{2}$

Explanation:

$2x^2 + 7x - 4$

= $2x^2 + 8x - x - 4$

= 2x(x + 4) - 1(x + 4)

= (2x - 1)(x + 4)

$2x - 1 = 0$ and $x + 4 = 0$

$x = \frac{1}{2}$ and $x = -4$

Therefore, one zero of the given polynomial is $\frac{1}{2}$

6. 4

7. 1

8. $\sqrt{3}x^2 - 2x$
   In each term of this expression, the exponent of the variable x is a whole number.
   Hence, it is a polynomial.

9. We have,
   $104^3 + 96^3 = (100 + 4)^3 + (100 - 4)^3$
   $= 2(100^3 + 3 \times 100 \times 4^2)$ [$\because (a + b)^3 + (a - b)^3 = 2(a^3 + 3ab^2)$]
   $= 2(1000000 + 300 \times 16)$
   $= 2(1000000 + 4800)$
   $= 2(1004800)$
   $= 2009600$

10. We have,
   $(\frac{1}{2}a - 3b)(3b + \frac{1}{2}a)(\frac{1}{4}a^2 + 9b^2)$
   $=(\frac{1}{2}a - 3b)(\frac{1}{2}a + 3b)(\frac{1}{4}a^2 + 9b^2)$
   $= [(\frac{1}{2}a)^2 - (3b)^2][\frac{1}{4}a^2 + 9b^2]$ [$\because (a - b)(a + b) = a^2 - b^2$]
   $=[\frac{1}{4}a^2 - 9b^2][\frac{1}{4}a^2 + 9b^2]$
   $= (\frac{1}{4}a^2)^2 - (9b^2)^2$ [$(a - b)(a + b) = a^2 - b^2$]
   $= \frac{1}{16}a^4 - 81b^4$

11. $25x^2 + 4y^2 + 9z^2 - 20xy - 12yz + 30zx$
   $\Rightarrow (5x)^2 + (2y)^2 + (3z)^2 - 2\times 5x\times 2y - 2\times 2y\times 3z + 2\times 3z\times 5x$
   $= (5x)^2 + (-2y)^2 + (3z)^2 + 2(5x)(-2y) + 2(-2y)(3z) + 2(3x)(5x)$
   $= (5x - 2y + 3z)^2$ [$\because a^2 + b^2 + c^2 + 2ab + 2bc + 2ca = (a + b + c)^2$]

12. Let p(x) = $2x^2 + kx - 12$

Since, $x = \frac{3}{2}$ is a zero of the polynimial.

$\therefore \quad P\left(\frac{3}{2}\right) = 0 \Rightarrow 2\left(\frac{3}{2}\right)^2 + k\left(\frac{3}{2}\right)$-12=0

$\Rightarrow \quad \frac{9}{2} + \frac{3k}{2} - 12 = 0 \Rightarrow \frac{3k}{2} = \frac{24-9}{2}$

$\Rightarrow$ 3k = 15 $\Rightarrow$ k = 5

Hence, the value of k is 5.

13. Given: a + b + c = 9 and $a^2 + b^2 + c^2 = 35$

We know that,

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

$\Rightarrow a^3 + b^3 + c^3 - 3abc = [a + b + c][(a^2 + b^2 + c^2) - (ab + bc + ca)]$ ......(i)

Now,

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

$\Rightarrow (9)^2 = 35 + 2(ab + bc + ca)$

$\Rightarrow$ 81 = 35 + 2(ab + bc + ca)

$\Rightarrow$ 2(ab + bc + ca) = 81 - 35 = 46

$\Rightarrow$ ab + bc + ca = $\frac{46}{2}$ = 23

Substituting the values in (i), we get,

$a^3 + b^3 + c^3 - 3abc = 9(35 - 23)$

= 9 $\times$ 12

= 108

14. By remainder theorem, when f(x) is divided by (x + 2), the remainder is equal to f(-2).

Now, f(x) = $2x^4 - 6x^3 + 2x^2 - x + 2$

$\Rightarrow f(-2) = 2(-2)^4 - 6(-2)^3 + 2(-2)^2 - (-2) + 2$

$\Rightarrow$ f(-2) = 2 $\times$ 16 - 6 $\times$ (-8) + 2 $\times$ 4 + 2 + 2 = 32 + 48 + 8 + 2 + 2 = 92

Hence, required remainder = 92.

15. By division algorithm, when p(x) = $4x^4 - 2x^3 - 6x^2 + x - 5$ is divided by q(x) = $2x^2 + x - 1$, the remainder is a linear expression.

So, let r(x) = ax + b be subtracted from p(x) so that the result is divisible by q(x).

Let f(x) = p(x) - r(x) = p(x) - (ax + b) or, $f(x) = (4x^4 - 2x^3 - 6x^2 + x - 5) - (ax + b)$

or, $f(x) = 4x^4 - 2x^3 - 6x^2 + x(1 - a) - 5 - b$

We have,

$q(x) = 2x^2 + x - 1 = 2x^2 + 2x - x - 1 = 2x(x + 1) - 1(x + 1) = (x + 1)(2x - 1)$

Clearly, x + 1 and 2x - 1 are factors of q(x). Therefore, f(x) will be divisible by q(x) if x + 1 and 2x - 1 are factors of f(x)

i.e., $f(-1) = 0$ and $f(\frac{1}{2}) = 0$

$\Rightarrow 4 \times (-1)^4 - 2 \times (-1)^3 - 6 \times (-1)^2 + (-1)(1 - a) - 5 - b = 0$

and, $4\left(\frac{1}{2}\right)^4 - 2 \times \left(\frac{1}{2}\right)^3 - 6 \times \left(\frac{1}{2}\right)^2 + \frac{1}{2}(1 - a) - 5 - b = 0$

$\Rightarrow 4 + 2 - 6 - 1 + a - 5 - b = 0$ and $\frac{1}{4} - \frac{1}{4} - \frac{3}{2} + \frac{1}{2} - \frac{a}{2} - 5 - b = 0$

$\Rightarrow a - b - 6 = 0$ and $-\frac{a}{2} - b - 6 = 0$

$\Rightarrow a - b = 6$ and $a + 2b = -12$

$\Rightarrow (a - b) - (a + 2b) = 6 - (-12) \Rightarrow -3b = 18 \Rightarrow b = -6$

Putting b = -6 in a - b = 6, we have

$a - (-6) = 6 \Rightarrow a + 6 = 6 \Rightarrow a = 0$

Putting the values of a and b in r(x) = ax + b, we get

$r(x) = 0 \times x - 6 = -6$

Hence, p(x) is divisible by q(x), if r(x) = - 6 is subtracted from p(x).