CBSE Test Paper 02

CH-2 Polynomials

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1. The factors of $x^2 - 9$ is
   a. $(x-3)(x-3)$
   b. $(x+3)(x+3)$
   c. $(x+3)(x-3)$
   d. $(x-3)(x+9)$
2. A polynomial of degree ____ is called a linear polynomial.
   a. 1
   b. 2
   c. 3
   d. 0
3. Which of the following is a polynomial in one variable?
   a. $x^2 + x^{-2}$
   b. $\sqrt{2} - x^2 + 3x$
   c. $\sqrt{2x} + 9$
   d. $x^5 + y^8 + 9$
4. If p(x) = (x – 1)(x + 1), then the value of p(2) + p(1) – p(0) is
   a. 2
   b. 4
   c. 1

d. 3

5. If both $x-2$ and $x-\frac{1}{2}$ are the factors of px^2+5x+r, then

   a. none of these

   b. 2p = r

   c. p = r

   d. p = 2r

6. Fill in the blanks:

   The maximum number of terms in a polynomial of degree 10 is ________.

7. Fill in the blanks:

   $\sqrt{2}$ is a polynomial of degree ________.

8. Find p(0), p(1) and p(2) of the polynomial: $p(t)=2+t+2t^2-t^3$

9. Factorize: $x^4 + x^2 + 1$

10. If $x^2 -1$ is a factor of $ax^3+ bx^2+ cx + d$, show that $a + c =0$.

11. Check whether $7+3x$ is a factor of $3x^3+7x$.

12. Factorise: $84 - 2r - 2r^2$

13. Factorize the polynomial:
    $27-125a^3-135a+225a^2$

14. Factorise: $4x^2 + 20x + 25$

15. The polynomial $3x^3+ ax^2 + 3x + 5$ and $4x^3 + x^2 - 2x + a$ leave remainder when divided by (x - 2) respectively. If $R_1 - R_2 = 9$, find the value of a.

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Solution

1. (c) $(x+3)(x-3)$
   Explanation:

   $x^2 - 9$

   $= x^2 - 3^2$

   Using identity $a^2 - b^2 = (a + b)(a - b)$

   $= (x + 3)(x - 3)$

2. (a) 1
   Explanation: A polynomial of degree 1 is called a linear polynomial.

   Its general form is $ax+b$

3. (b) $\sqrt{2}-x^2+3x$
   Explanation:

   $\sqrt{2}-x^2+3x$ is a polynomial in one variable x and also the powers of each term is a whole number.

4. (b) 4
   Explanation: Given: p(x) = (x – 1)(x + 1), then

   p(2) + p(1) – p(0)

   $= (2-1)\,(2+1)+(1-1)\,(1+1)-(0-1)\,(0+1)$

   $= 1\times 3+0\times 2-(-1)\times 1$

   $= 3+0+1$

   = 4

5. (c) p = r

Explanation:

If both $x-2$ and $x-\frac{1}{2}$ are the factors of f(x) = px^2+5x+r, then

$f(2)=0$

=> $p(2)^2+5(2)+r=0$

=> $4p+10+r=0$

=> $4p+r=-10$ ....(i)

Also, $f\left(\frac{1}{2}\right)=0$

=> $p\left(\frac{1}{2}\right)^2+5\left(\frac{1}{2}\right)+r=0$

=> $\frac{p}{4}+\frac{5}{2}+r=0$

=> $p+10+4r=0$

=> $p+4r=-10$ ....(ii)

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

$4p+r=p+4r$

=> $3p=3r$

=> $p=r$

6. 11

7. 0

8. According to the question,

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

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

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

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

9. We have,

   $x^4 + x^2 + 1$

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

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

10. Since $x^2 - 1 = (x+1)(x-1)$ is a factor of $p(x) = ax^3 + bx^2 + cx + d$

    $\therefore p(1) = p(-1) = 0$

    $\Rightarrow$ a + b + c + d = -a + b - c + d = 0

    $\Rightarrow 2a + 2c = 0$

    $\Rightarrow 2(a + c) = 0$

    $\Rightarrow$ a + c = 0

11. We know that if the polynomial $7 + 3x$ is a factor of $3x^3 + 7x$, then on dividing the polynomial $3x^3 + 7x$ by $7 + 3x$, we must get the remainder as 0.

    We need to find the zero of the polynomial 7 + 3x

    $7 + 3x = 0$

    $\Rightarrow \quad x = -\dfrac{7}{3}$

    While applying the remainder theorem, we need to put the zero of the polynomial $7 + 3x$ in the polynomial $3x^3 + 7x$,to get

    $p(x) = 3x^3 + 7x$

    $p\left(\frac{-7}{3}\right) = 3\left(-\frac{7}{3}\right)^3 + 7\left(-\frac{7}{3}\right) = 3\left(-\frac{343}{27}\right) - \frac{49}{3}$

    $= -\frac{343}{9} - \frac{49}{3} = \frac{-343-147}{9}$

    $= \frac{-490}{9}$.

    We conclude that on dividing the polynomial $3x^3 + 7x$ by 7 + 3x, we will get the remainder as $\frac{-490}{9}$ which is not 0.

    Therefore, we conclude that 7 + 3x is not a factor of $3x^3 + 7x$

12. In order to factorise 84 - 2r - $2r^2$, we have to find two numbers p and q such that p + q = -2 and pq = - 168.

    Clearly, (-14) + 12 = -2 and (-14) × 12 = -168.

    So, we write the middle term - 2r as (-14r) + 12r.

$\therefore$ 84 - 2r - 2r^2 = -2r^2 - 2r + 84

= -2r^2 - 14r + 12r + 84

= -2r(r + 7) + 12(r + 7)

= (r + 7)(-2r + 12)

= -2(r + 7)(r - 6) = -2(r - 6)(r + 7)

13. $27-125a^3-135a+225a^2$

The expression $27-125a^3-135a+225a^2$ can be written as

$=(3)^3-(5a)^3-3\times3\times3\times5a+3\times3\times5a\times5a$

$=(3)^3-(5a)^3+3\times3\times5a\left(3-5a\right).$

Using identity $\left(x-y\right)^3=x^3-y^3-3xy\left(x-y\right)$

$\left(3\right)^3-\left(5a\right)^3+3\times3\times5a\left(3-5a\right),weget(3-5a)^3$

Therefore, after factorizing the expression

$27-125a^3-135a+225a^2,weget(3-5a)^3$

14. We have,

4x^2 + 20x + 25 = $(2x)^2$ + 2(2x)(5) + $(5)^2$

= $(2x + 5)^2$ [$\because$ a^2 + 2ab + b^2 = $(a + b)^2$]

= (2x + 5)(2x + 5)

15. Let f (x) = 3x^3 + ax^2 + 3x + 5

and g(x) = 4x^3+ x^2 - 2x + a

Here, the zero of (x - 2) is x = 2 [$\because$ x - 2 = 0 $\Rightarrow$ x = 2]

Where f(x) and g(x) are divided by (x - 2), then we get the remainders R_1 and R_2

$\therefore$ f(2) = 3$(2)^3$ + a$(2)^2$ + 3(2) + 5

= 24 + 4a + 6 + 5 = 35 + 4a = R_1

and g(2) = 4$(2)^3$ + $(2)^2$ - 2(2) + a

= 32 + 4 - 4 + a = 32 + a = R_2

Also, R_1 - R_2 = 9

$\therefore$ 35 + 4a - (32 + a) = 9

$\Rightarrow$ 3 + 3a = 9 $\Rightarrow$ 3a = 6 $\Rightarrow$ a = 2