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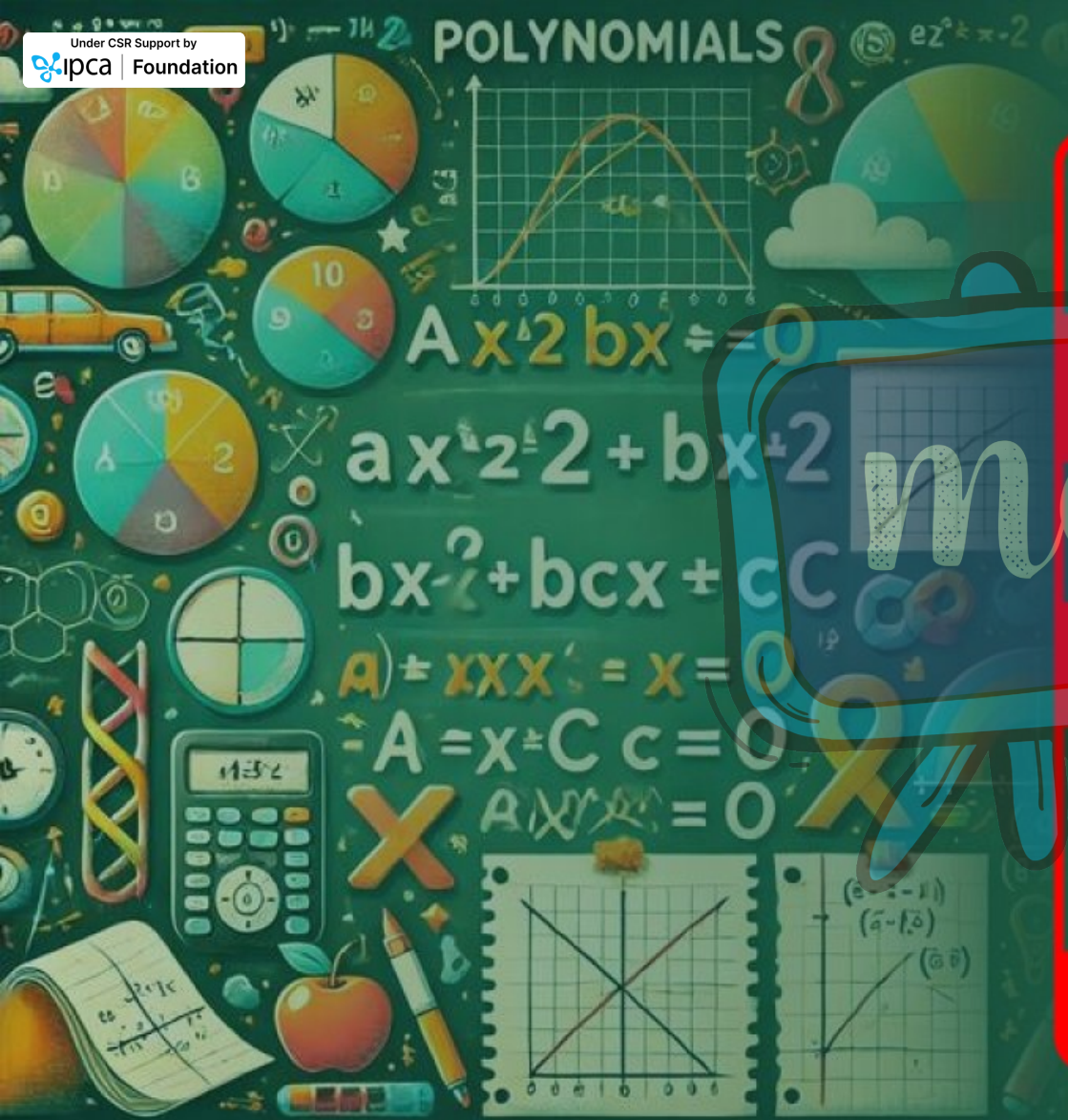

CLASS – 9

MATHS

Chapter - 2

Polynomials

Part – 9

Exercise 2.3

Vikas Saini

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1. Determine which of the following polynomials has (x + 1) a factor :

(i) $x^3 + x^2 + x + 1 = p(x)$

$x + 1 = 0$

$x = -1$

at $x = -1$

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

$= -1 + 1 - 1 + 1$

$p(-1) = 0$

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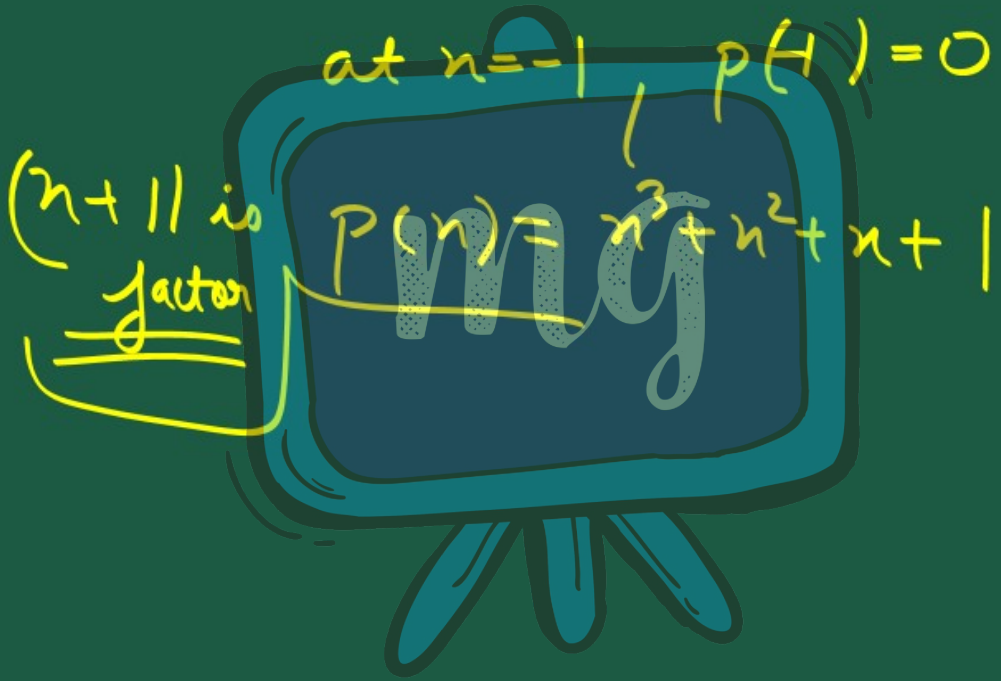

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(ii) $x^4 + x^3 + x^2 + x + 1$

$P(n) = n^4 + n^3 + n^2 + n + 1$

$-1 \times -1 \times -1 \times -1$

$= -1$

at $n = -1$

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

$= 1 - 1 + 1 - 1 + 1$

$P(-1) = 1$

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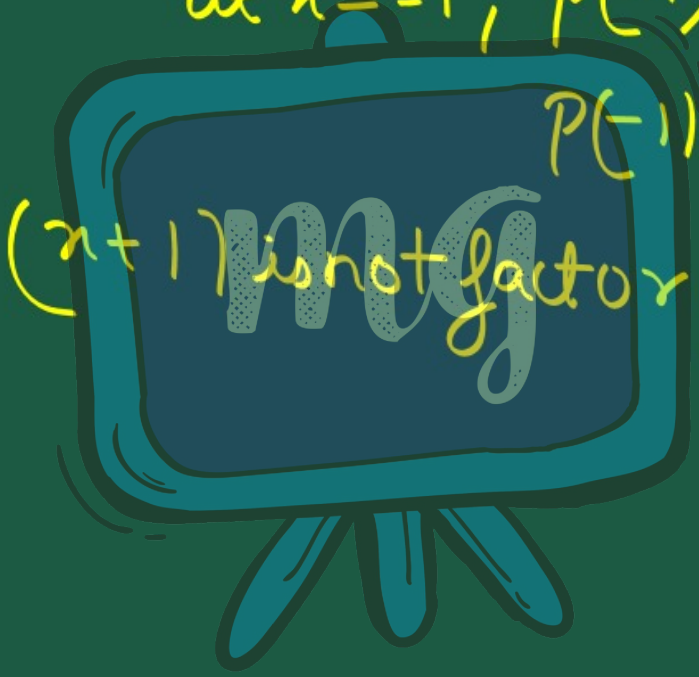
at $x = -1$, $P(-1) \neq 0$

$P(-1) = 1$

$(x+1)$ is not factor of given Polynomial



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(iii) $x^4 + 3x^3 + 3x^2 + x + 1$

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

at $x = -1$

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

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

$= 1 - 3 + 3 - 1 + 1$

$p(-1) = 1$

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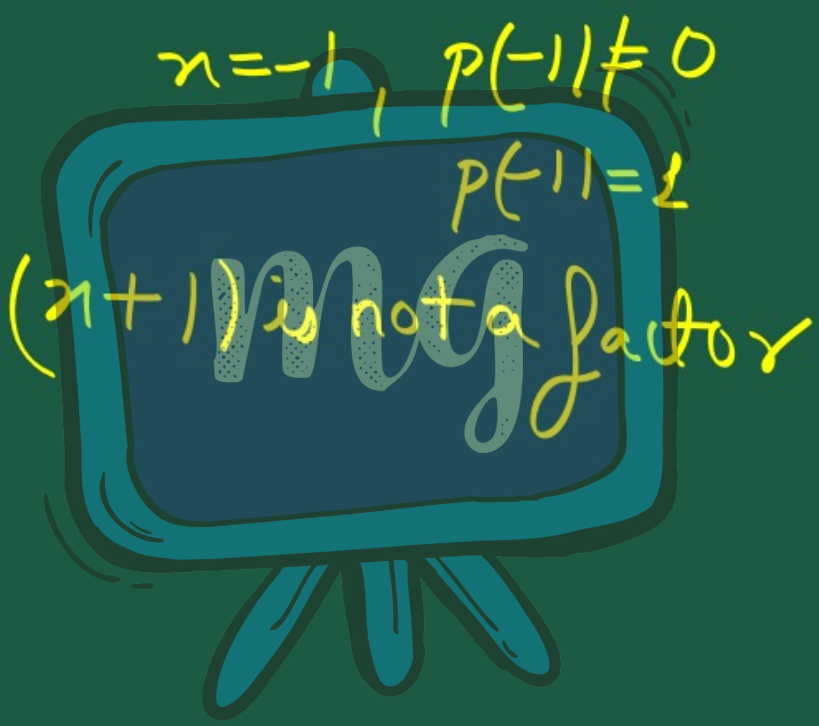

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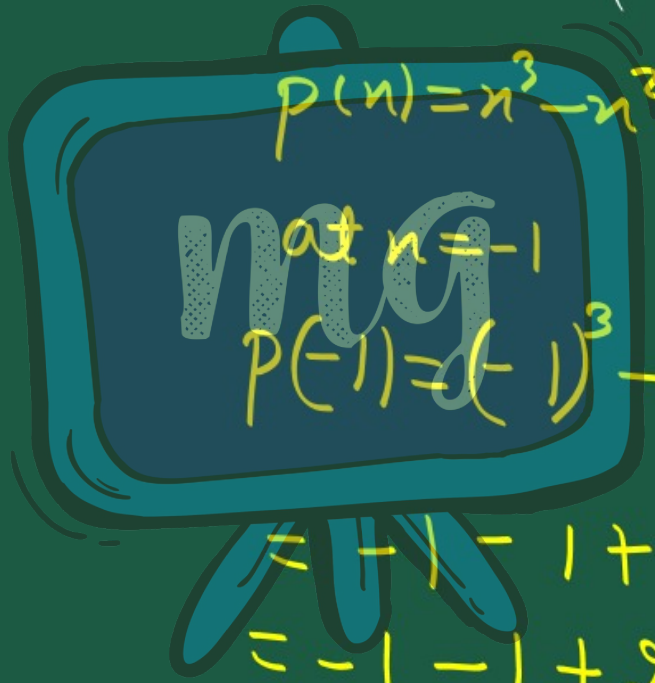
(iv) $x^3 - x^2 - \left(2+\sqrt{2}\right)x + \sqrt{2}$



$p(x) = x^3 - x^2 - (2+\sqrt{2})x + \sqrt{2}$

at $x = -1$

$p(-1) = (-1)^3 - (-1)^2 - (2+\sqrt{2})(-1) + \sqrt{2}$

$= -1 - 1 + (2+\sqrt{2}) + \sqrt{2}$

$= -1 - 1 + 2 + \sqrt{2} + \sqrt{2}$

$= \cancel{-2 + 2} + \sqrt{2} + \sqrt{2}$

$= 2\sqrt{2}$

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at $x=-1$, $p(1) \neq 0$

$p(-1) = 2\sqrt{2}$

$(x+1)$ is not a factor

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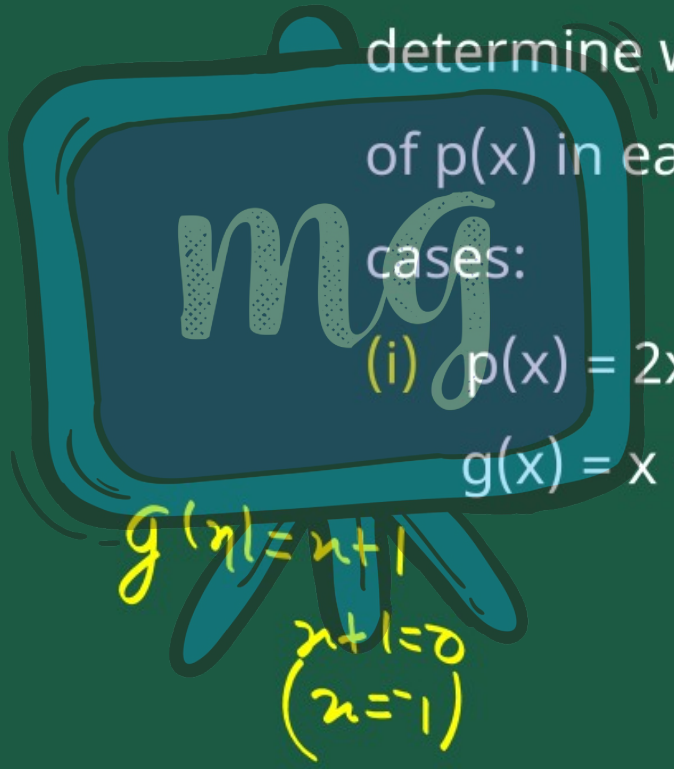
2. Use the Factor Theorem to determine whether g(x) is a factor of p(x) in each of the following cases:

(i) $p(x) = 2x^3 + x^2 - 2x + 1$;

$g(x) = x + 1$



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$g(x) = x + 1$

$g(-1) = -1 + 1$

$x + 1 = 0$

$x = -1$

$g(-1) = 0$

$x = -1$ is zero of $g(x)$

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

at $x = -1$

$p(-1) = 2 \times (-1)^3 + (-1)^2 - 2 \times (-1) + 1$

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

$= -2 + 1 + 2 + 1$

$p(-1) = 2$

$p(-1) \neq 0$

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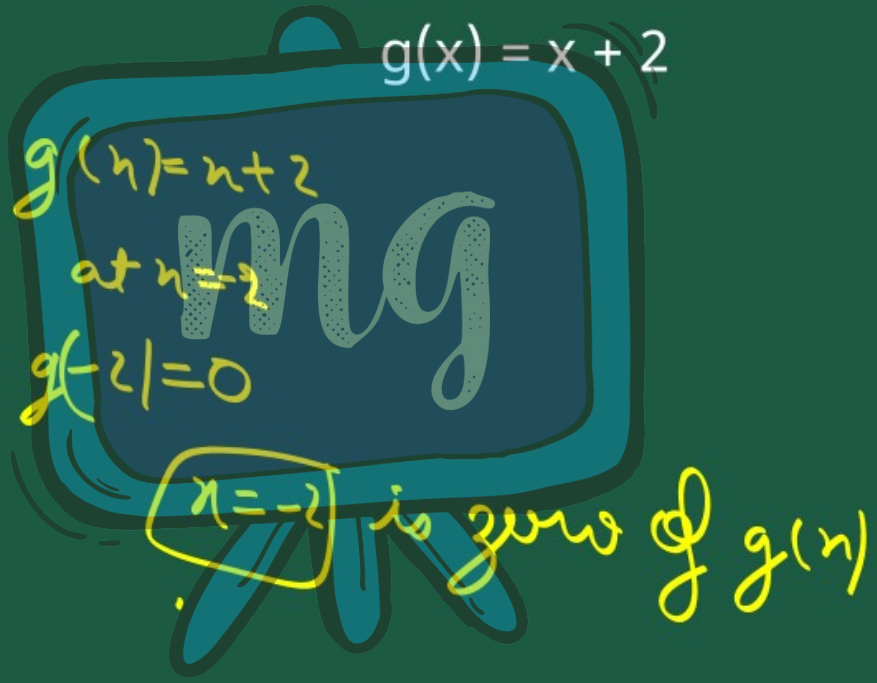
(ii) $p(x) = x^3 + 3x^2 + 3x + 1;$

$g(x) = x + 2$



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$p(x) = x^3 + 3x^2 + 3x + 1$

$-2x-2x-x$

at $x = -2$

$p(-2) = (-2)^3 + 3\times(-2)^2 + 3\times(-2) + 1$

$= -8 + 3\times 4 - 6 + 1$

$= -8 + 12 - 6 + 1$

$= 13 - 14$

$P(-2) = -1$

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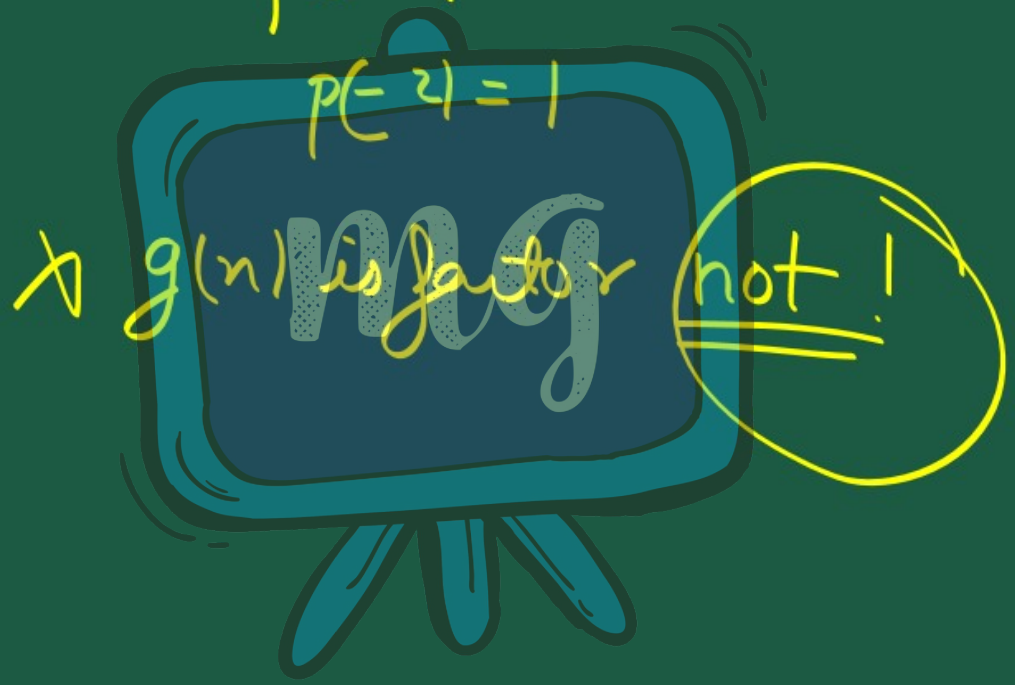

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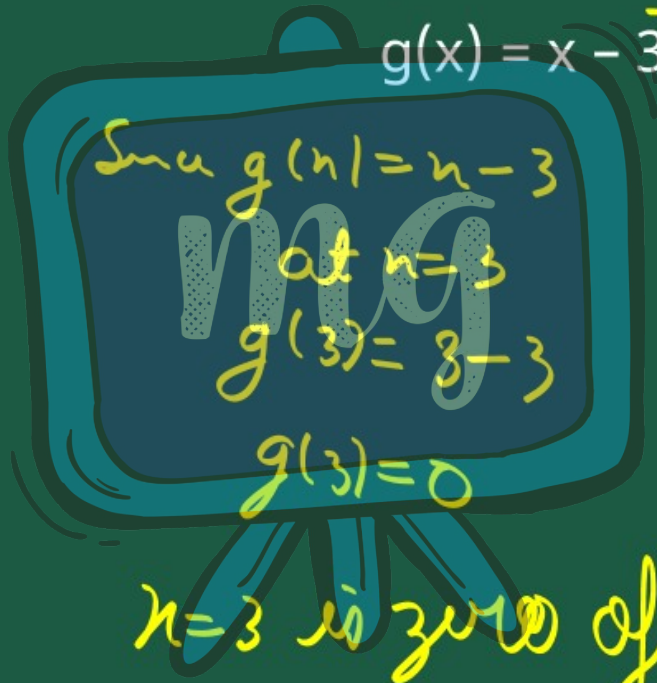
(iii) $p(x) = x^3 - 4x^2 + x + 6$;

$g(x) = x - 3$



$x = 3$ is zero of $g(x)$

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$p(x) = x^3 - 4x^2 + x + 6$

at $x = 3$

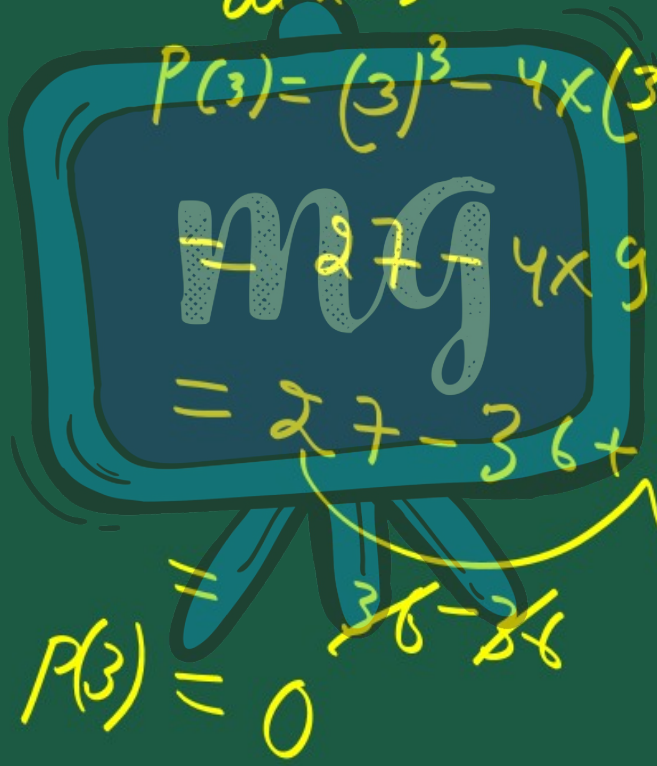
$P(3) = (3)^3 - 4\times(3)^2 + 3 + 6$

$= 27 - 4\times 9 + 3 + 6$

$= 27 - 36 + 3 + 6$

$= 36 - 36$

$P(3) = 0$



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$x = 3$ is zero $g(x)$ & $p(x)$ also

$g(x)$ is factor of $p(x)$



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3. Find the value of k, if x – 1 is a factor of p(x) in each of the following cases:

(i) $p(x) = x^2 + x + k$

$x - 1 = 0$

$x = 1$

Since $(x-1)$ is factor of $p(x)$

$\therefore p(1) = 0$

$p(1) = (1)^2 + (1) + k$

$= 1 + 1 + k$

$= 2 + k$

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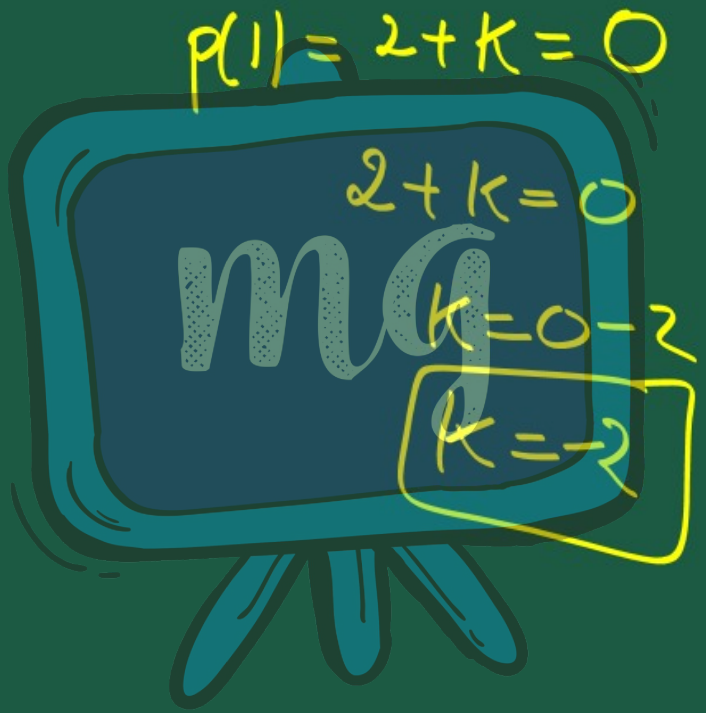

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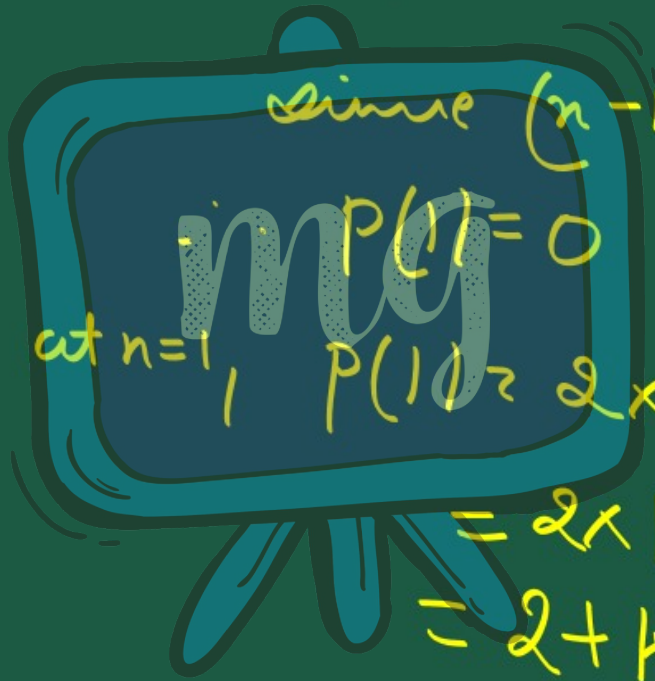
(ii) $p(x) = 2x^2 + kx + \sqrt{2}$



Since $(x-1)$ is factor

$\therefore p(1) = 0$

at $x=1$, $p(1) = 2\times(1)^2 + k\times 1 + \sqrt{2}$

$= 2\times 1 + k + \sqrt{2}$

$= 2 + k + \sqrt{2}$

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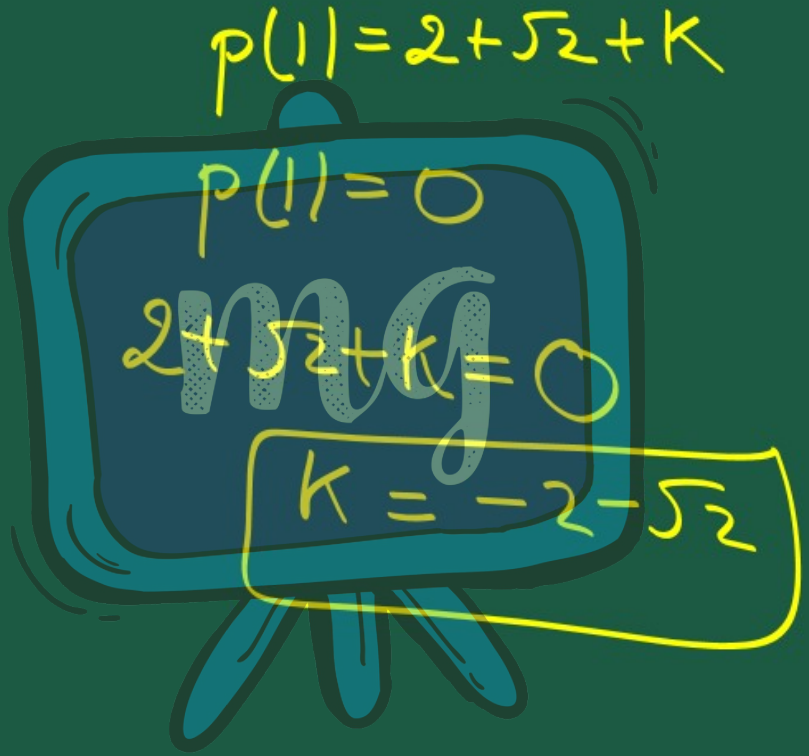

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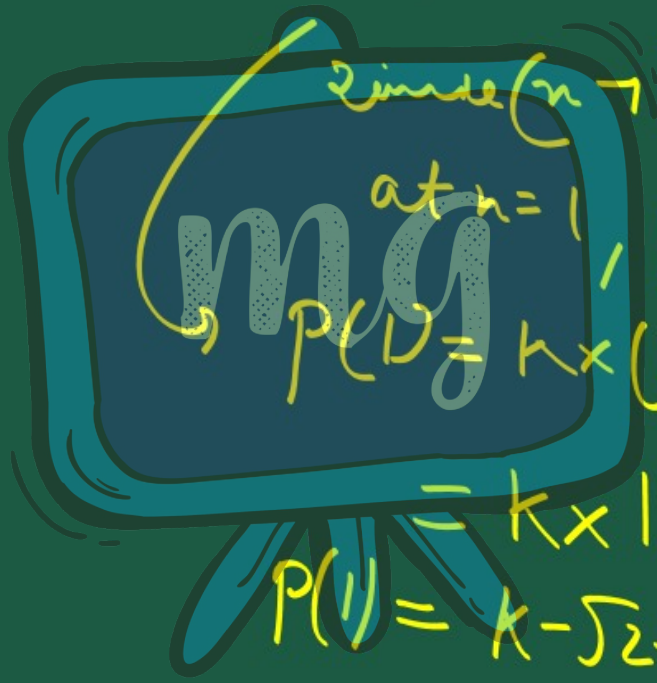
(iii) $p(x) = kx^2 - \sqrt{2}x + 1$



since $(x-1)$ is factor of $p(x)$

at $x=1$, $p(1)=0$

$\Rightarrow p(1) = k \times (1)^2 - \sqrt{2} \times 1 + 1$

$= k \times 1 - \sqrt{2} + 1$

$p(1) = k - \sqrt{2} + 1$

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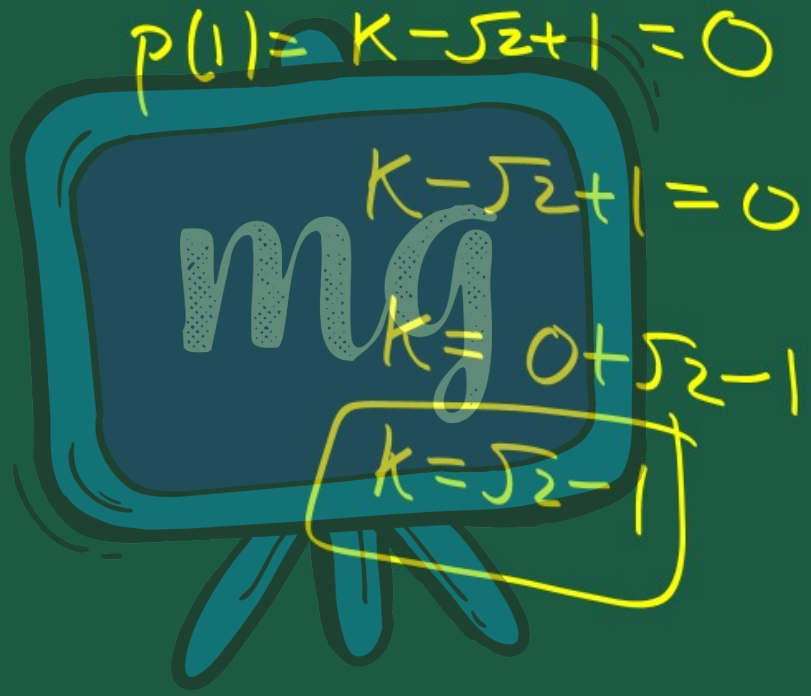

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(iv) $p(x) = kx^2 - 3x + k$

Since, $(x-1)$ is factor of $p(x)$

$\therefore p(1) = 0$

at $x = 1$

$p(1) = k(1)^2 - 3 \times (1) + k$

$= k \times 1 - 3 + k$

$= k - 3 + k$

$= 2k - 3$

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