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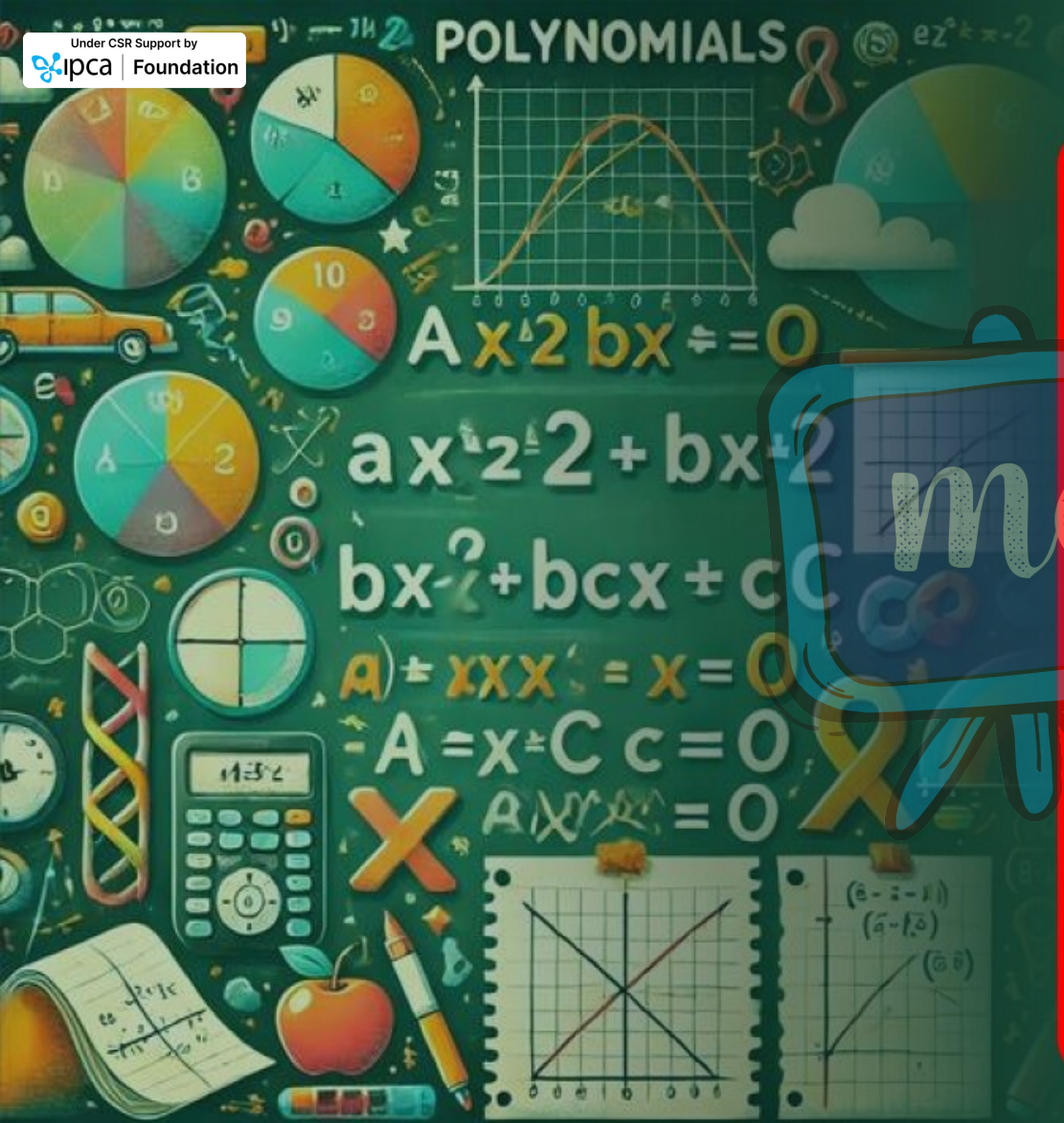

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कक्षा – 9

गणित

अध्याय – 2

बहुपद

भाग – 3

प्रश्नावली 2.2

हर्ष गोयल

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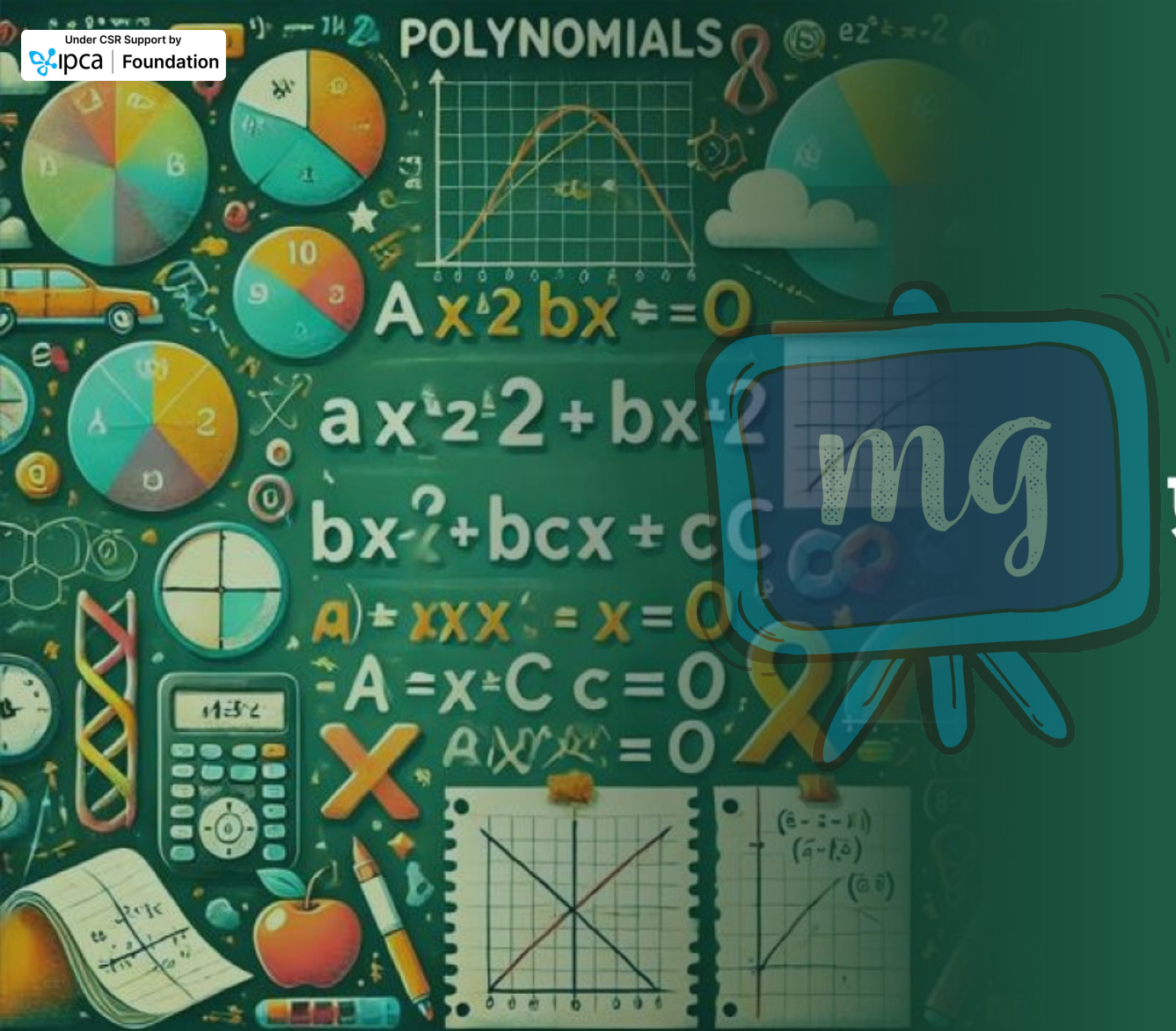

प्रश्नावली 2.2

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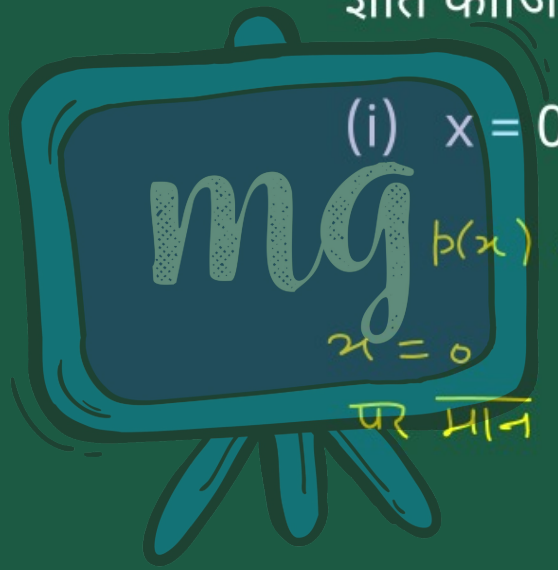
1. निम्नलिखित पर बहुपद $5x - 4x^2 + 3$ के मान ज्ञात कीजिए :



(i) $x = 0$

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

$x = 0$ पर मान

$p(0) = 5(0) - 4(0)^2 + 3$

$= 0 - 0 + 3$

$p(0) = 3$

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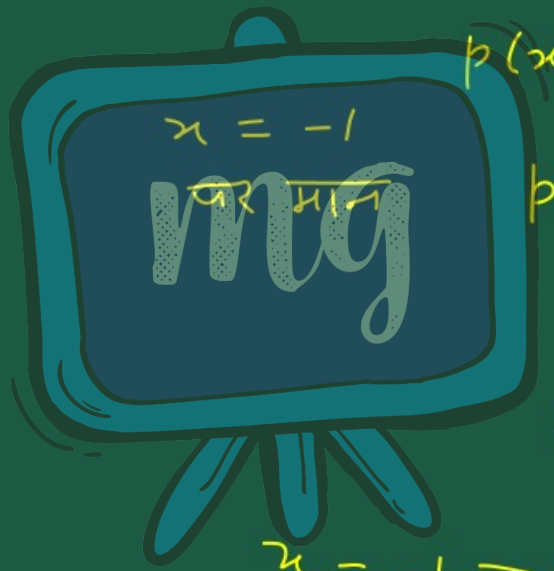
(ii) x = -1



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

$x = -1$ पर मान

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

$= -5 - 4 + 3$

$= -9 + 3$

$p(-1) = -6$

$x = -1$ पर बहुपद $p(x) = 5x - 4x^2 + 3$ का मान -6

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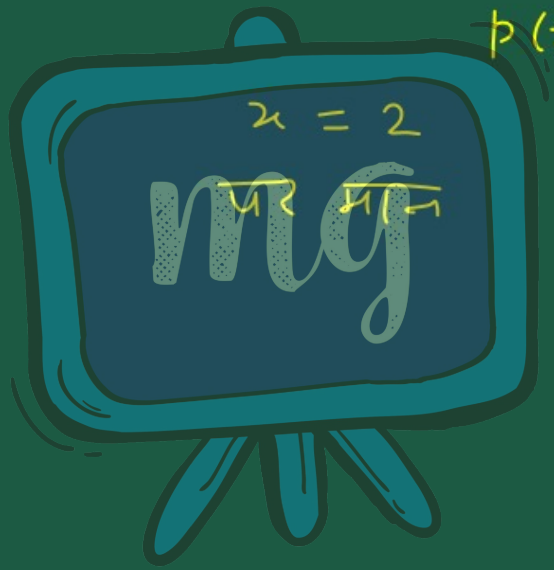
(iii) x = 2



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

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

$= 10 - 4 \times 4 + 3$

$= 10 - 16 + 3$

$p(2) = 13 - 16$

$p(2) = -3$

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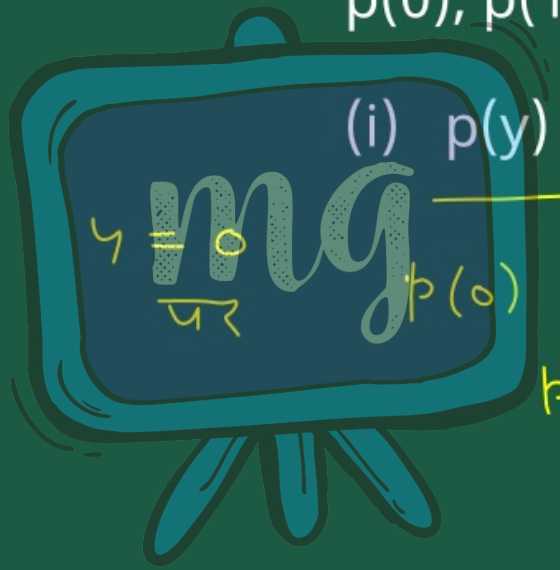
2. निम्नलिखित बहुपदों में से प्रत्येक बहुपद के लिए p(0), p(1) और p(2) ज्ञात कीजिए:



(i) $p(y) = y^2 - y + 1$

$y = 0$ पर

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

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

$p(0) = 1$

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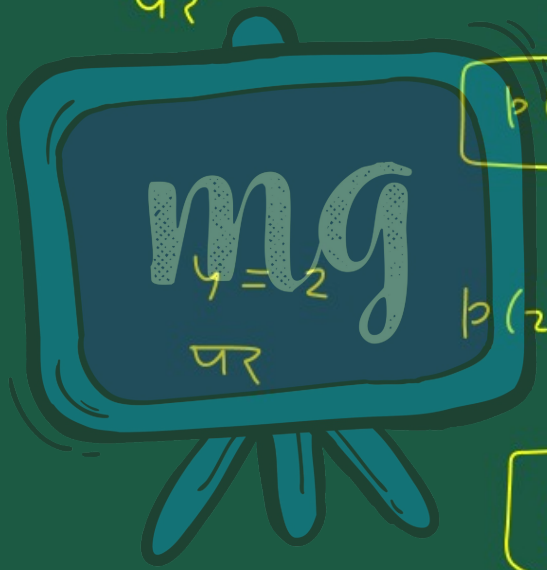
$p(y) = y^2 - y + 1$

$y = 1$ पर

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

$= 1 - 1 + 1$

$p(1) = 1$



$y = 2$ पर

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

$= 4 - 2 + 1$

$p(2) = 3$

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

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

$p(0) = 2$

$t = 1$

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

$= 2 + 1 + 2 - 1$

$p(1) = 4$

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

$t = 2$ पर

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

$$= 2 + 2 + 8 - 8$$

$$p(2) = 4$$



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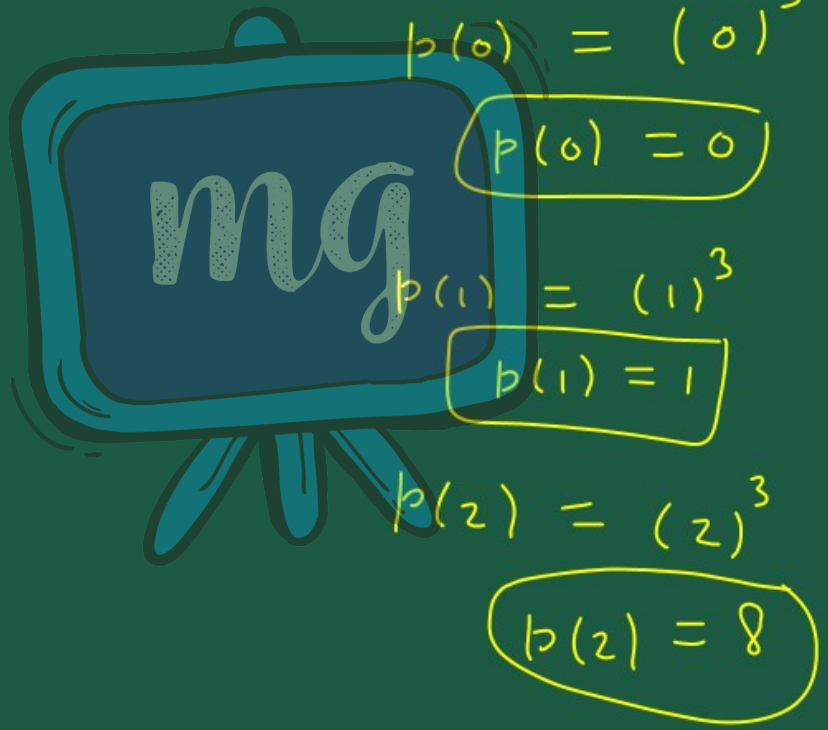
(iii) $p(x) = x^3$



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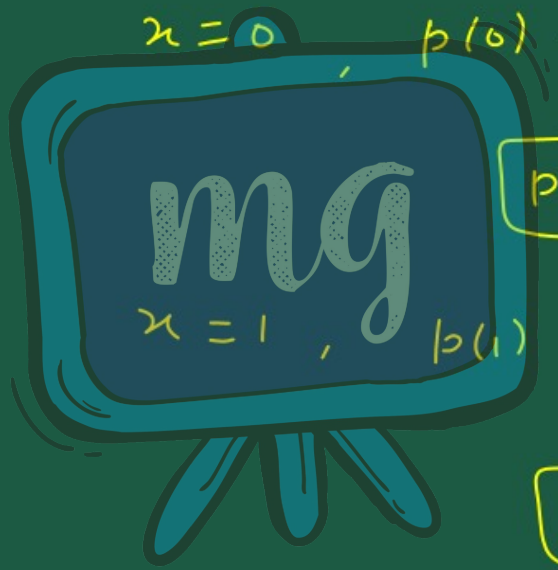
(iv) $p(x) = (x - 1)(x + 1)$



$x = 0$, $p(0) = (0 - 1)(0 + 1)$

$= (-1)(1)$

$p(0) = -1$

$x = 1$, $p(1) = (1 - 1)(1 + 1)$

$= 0 \times 2$

$p(1) = 0$

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$p(x) = (x-1)(x+1)$

$x = 2$ पर

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

$= 1 \times 3$

$p(2) = 3$



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3. सत्यापित कीजिए कि दिखाए गए मान निम्नलिखित स्थितियों में संगत बहुपद के शून्यक हैं:

(i) $p(x) = 3x + 1; x = -\frac{1}{3}$

$x = -\frac{1}{3}$ बहुपद $p(x)$ में रखने पर

$p(-\frac{1}{3}) = 3 \times -\frac{1}{3} + 1$

$= -1 + 1$

$= 0$

$\therefore x = -\frac{1}{3}$ पर बहुपद $p(x)$ का मान शून्य प्राप्त होता है।

अतः $x = -\frac{1}{3}$ बहुपद $p(x)$ का एक शून्यक है।

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(ii) $p(x) = 5x - \pi$; $x = \frac{4}{5}$

$x = \frac{4}{5}$ का मान बहुपद $p(x)$ में रखने पर

$p\left(\frac{4}{5}\right) = 5 \times \frac{4}{5} - \pi$

$= 4 - \pi \neq 0$

$p\left(\frac{4}{5}\right) \neq 0$

अतः $x = \frac{4}{5}$ बहुपद $p(x)$ का शून्यक नहीं

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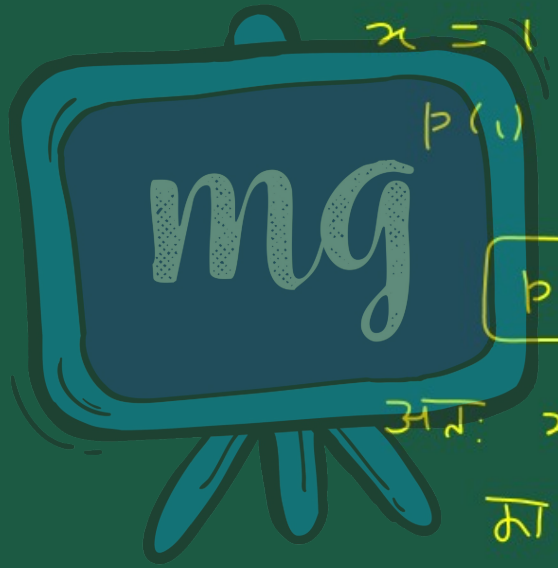
(iii) $p(x) = x^2 - 1$; $x = 1, -1$



$x = 1$ पर

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

$= 1 - 1$

$p(1) = 0$

अत: $x = 1$, बहुपद $p(x) = x^2 - 1$ का एक शून्यक है।

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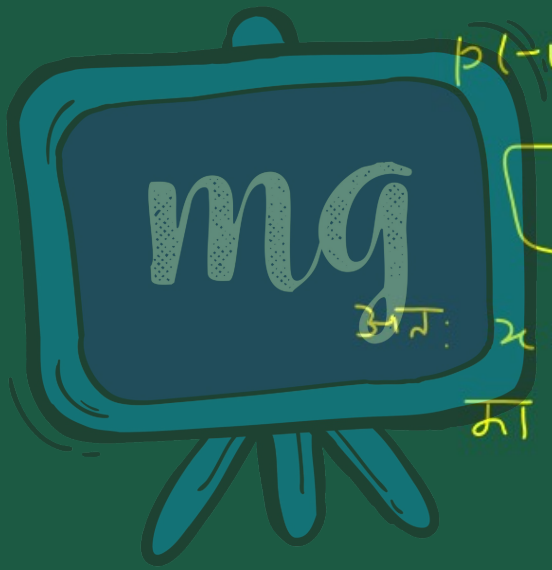
$p(x) = x^2 - 1$

$x = -1$ पर

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

$= 1 - 1$

$p(-1) = 0$



अतः $x = -1$ बहुपद $p(x) = x^2 - 1$ का एक शून्यक है।

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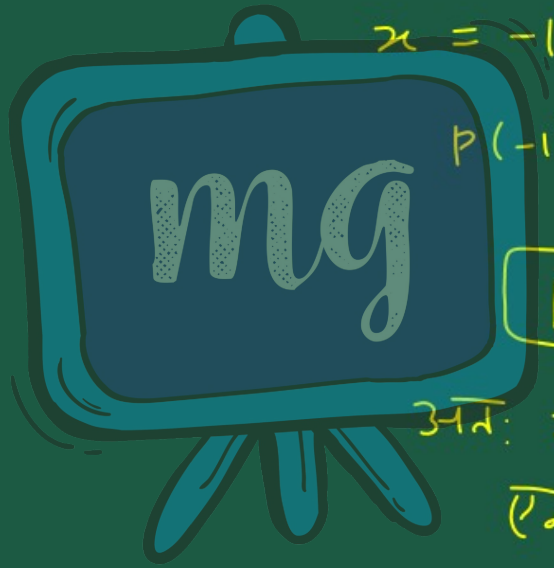
(iv) $p(x) = (x + 1)(x - 2)$; $x = -1, 2$



$x = -1$ पर

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

$= 0 \times -3$

$p(-1) = 0$

अतः $x = -1$, बहुपद $p(x)$ का एक शून्यक है।

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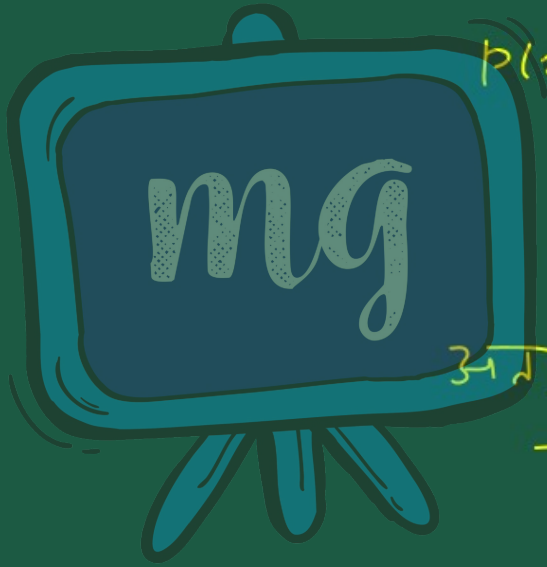
$p(x) = (x+1)(x-2)$

$x = 2$ पर

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

$= 3 \times 0$

$p(2) = 0$



अतः $x = 2$ शून्यक

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(v) $p(x) = x^2$; $x = 0$



$x = 0$ पर

$p(0) = (0)^2$

$p(0) = 0$

$x = 0$ शून्यक है (बहुपद $p(x)$ का)

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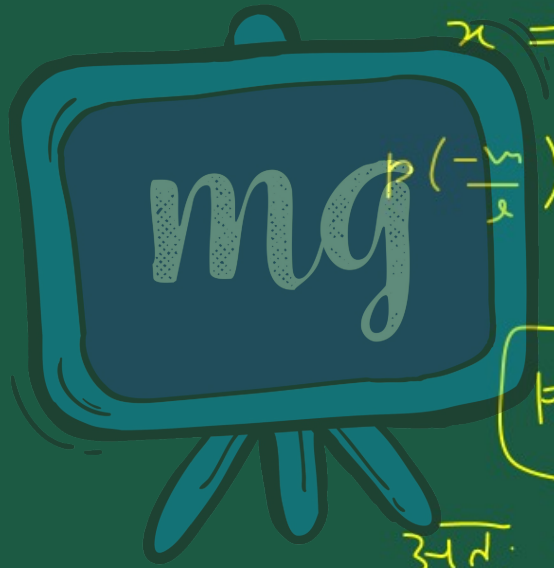
(vi) $p(x) = lx + m$; $x = -\frac{m}{l}$



$x = -\frac{m}{l}$ पर

$p\left(-\frac{m}{l}\right) = l \times \left(-\frac{m}{l}\right) + m$

$= -m + m$

$p\left(-\frac{m}{l}\right) = 0$

अत: $x = -\frac{m}{l}$ शून्यक है

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(vii) $p(x) = 3x^2 - 1;\ x = -\frac{1}{\sqrt{3}}, \frac{2}{\sqrt{3}}$



$x = -\frac{1}{\sqrt{3}}$

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

$= \cancel{3} \times \frac{1}{\cancel{3}} - 1$

$= 1 - 1$

$\boxed{p\left(\frac{-1}{\sqrt{3}}\right) = 0} \rightarrow$ शून्यक

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

$x = \frac{2}{\sqrt{3}}$

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

$= 3 \times \frac{4}{3} - 1$

$= 4 - 1$

$p\left(\frac{2}{\sqrt{3}}\right) = 3 \neq 0$

अत: $x = \frac{2}{\sqrt{3}}$ शून्यक नहीं है।

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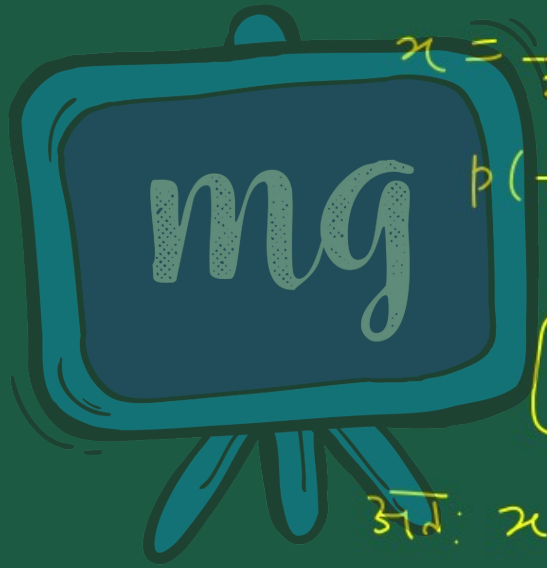
(viii) $p(x) = 2x + 1; x = \frac{1}{2}$



$x = \frac{1}{2}$ पर

$p\left(\frac{1}{2}\right) = x \times \frac{1}{2} + 1$

$= 1 + 1$

$p\left(\frac{1}{2}\right) = 2 \neq 0$

अतः $x = \frac{1}{2}$ शून्यक नहीं है।

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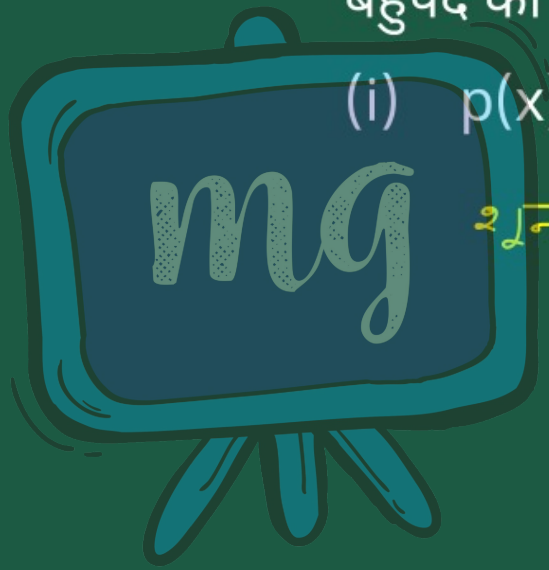
4. निम्नलिखित स्थितियों में से प्रत्येक स्थिति में बहुपद का शून्यक ज्ञात कीजिए:

(i) $p(x) = x + 5$



शून्यक का मान ज्ञात करने के लिए $p(x) = 0$

$x + 5 = 0$

$x = -5$

शून्यक $x = -5$

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(ii) $p(x) = x - 5$



शून्यक के लिए

$p(x) = 0$

$x - 5 = 0$

$x = 5$

शून्यक $x = 5$

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(iii) $p(x) = 2x + 5$



शून्यक के लिए

$p(x) = 0$

$2x + 5 = 0$

$2x = -5$

$x = \frac{-5}{2}$

शून्यक $x = -5/2$

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(iv) $p(x) = 3x - 2$



शून्यक के लिए

$p(x) = 0$

$3x - 2 = 0$

$3x = 2$

$x = \frac{2}{3}$

शून्यक $x = \frac{2}{3}$

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(v) $p(x) = 3x$



शून्यक के लिए

$p(x) = 0$

$3x = 0$

$x = 0$

अतः शून्यक $x = 0$

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(vi) $p(x) = ax\ ;\ a \neq 0$



2 चरों के लिए

$p(x) = 0$

$ax = 0 \quad (\because a \neq 0)$

$x = 0$

2 चरों $x = 0$

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(vii) $p(x) = cx + d$; $c \neq 0$, c, d वास्तविक संख्याएँ हैं।



शून्यक के लिए

$p(x) = 0$

$cx + d = 0$

$cx = -d$

$x = -d/c$

शून्यक $x = -d/c$