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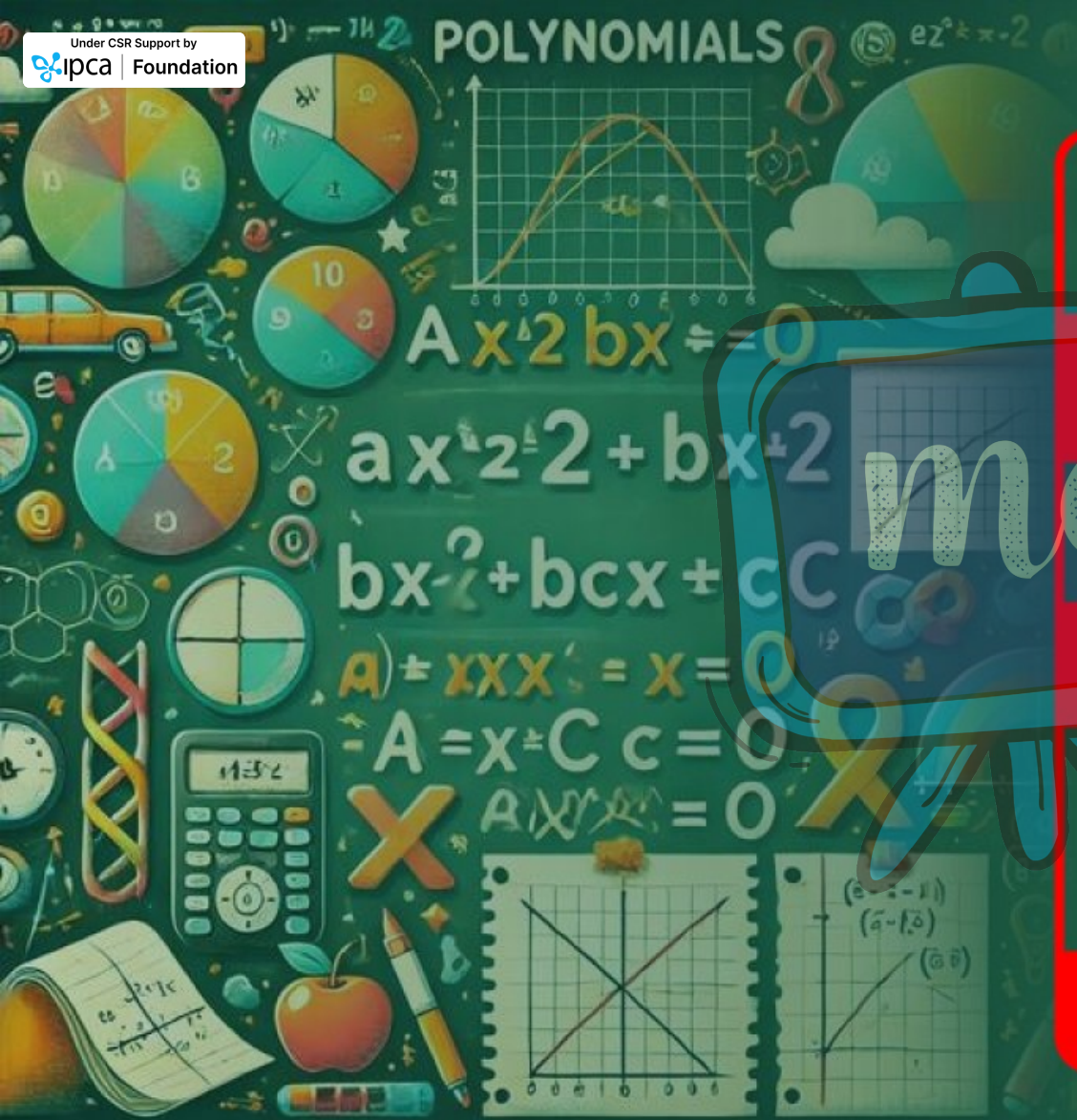

CLASS – 9

MATHS

Chapter - 2

Polynomials

Part – 8

Factorisation of Polynomial

Vikas Saini

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OVERVIEW

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1. Introduction to Polynomials
2. Zeroes of Polynomials
3. Factorisation of Polynomials
4. Algebraic Identities

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FACTORISATION OF CUBIC POLYNOMIAL



$p(x) = ax^3 + bx^2 + cx + d$

degree = Number of zeros = Linear multiple

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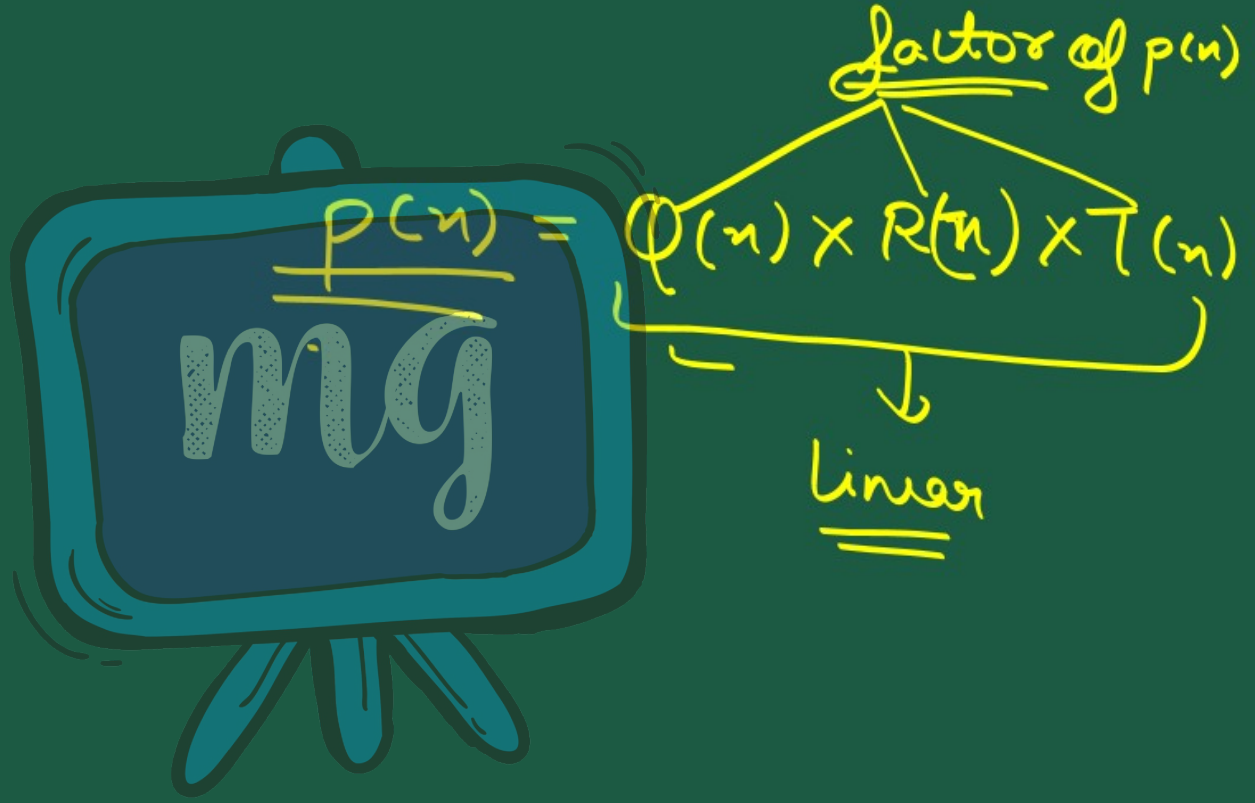

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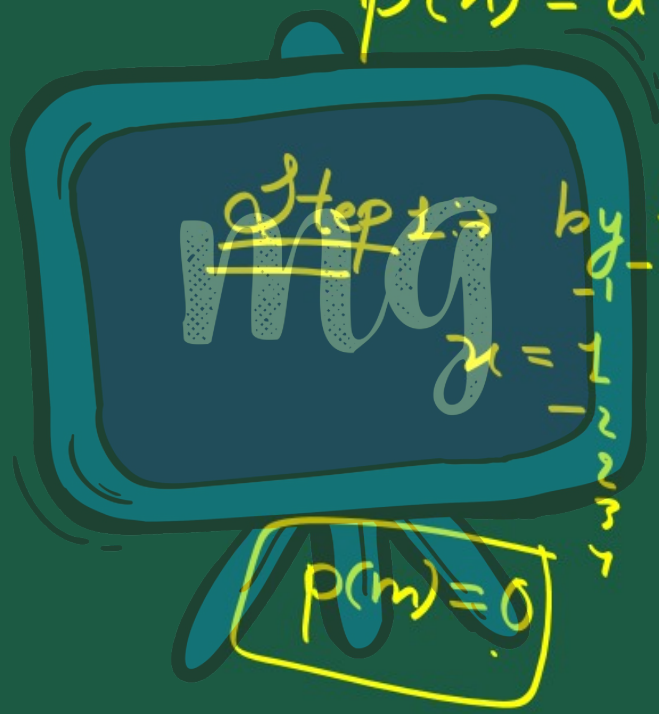

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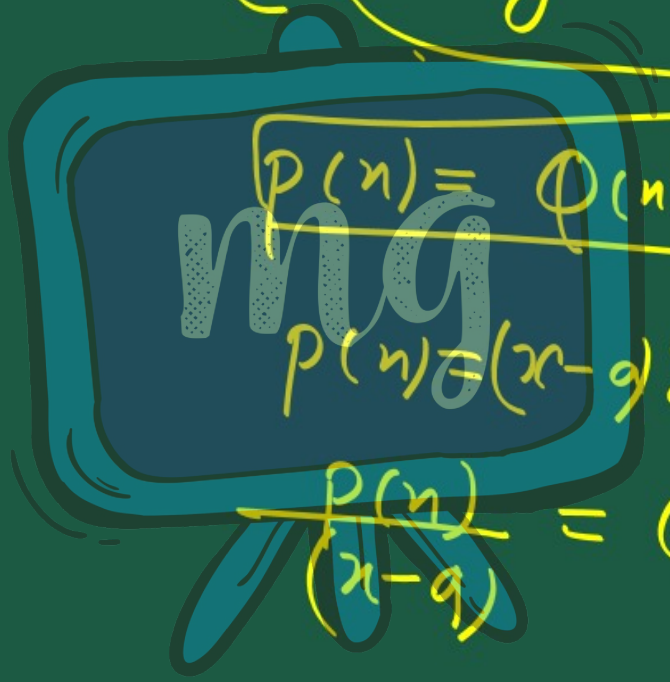
$(x-m)$ is factor ax^3+bx^2+cx+d

$$P(x) = Q(x) \times T(x) \times R(x)$$

$$P(x) = (x-a) \times Q(x) \times R(x)$$

$$\frac{P(x)}{(x-a)} = Q(x) \times R(x)$$



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$$\frac{P(x)}{(x-a)} = Q(x) \times R(x)$$

$$\frac{P(x)}{(x-a)} = H(x)$$

$H(x)$ → Quadratic Polynomial

$$P(x) = (x-a) \times H(x)$$

$$(x-a) \times Q(x) \quad R(x)$$

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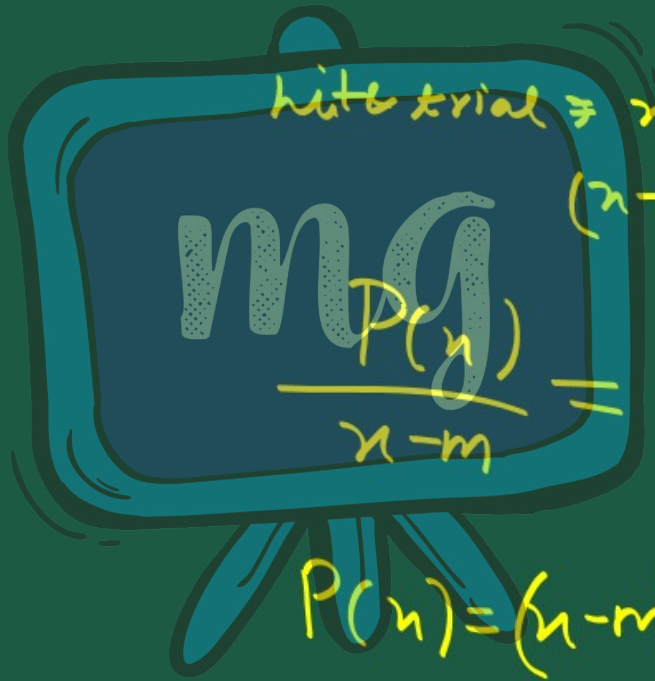
$P(x) = ax^3 + bx^2 + cx + d$



Write trial $\neq x = m$

$(x - m)$ is factor

$$\frac{P(x)}{x - m} = Q(x)$$

$Q(x)$ → Quadratic

$P(x) = (x - m) \times Q(x)$

$Q(x)$ → $(x - n)$ $(x - p)$

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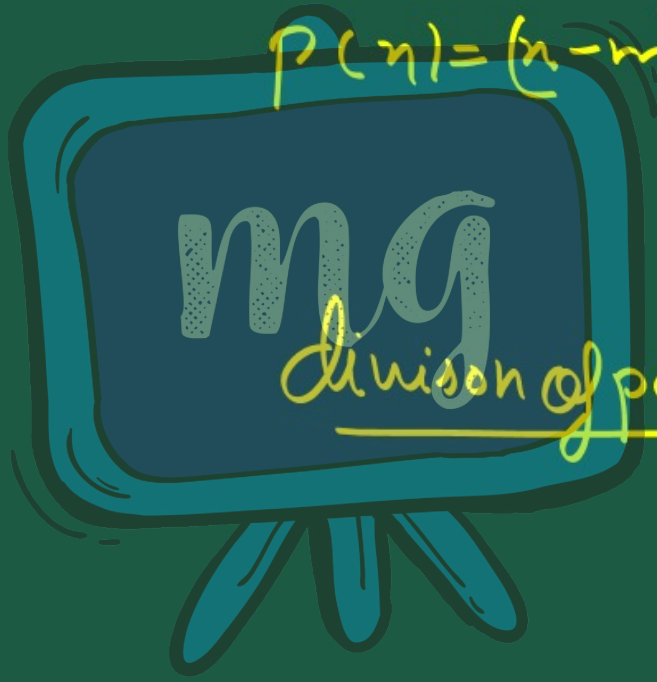
$p(x) = (x-m) \times (x-n) \times (x-p)$



division of polynomial

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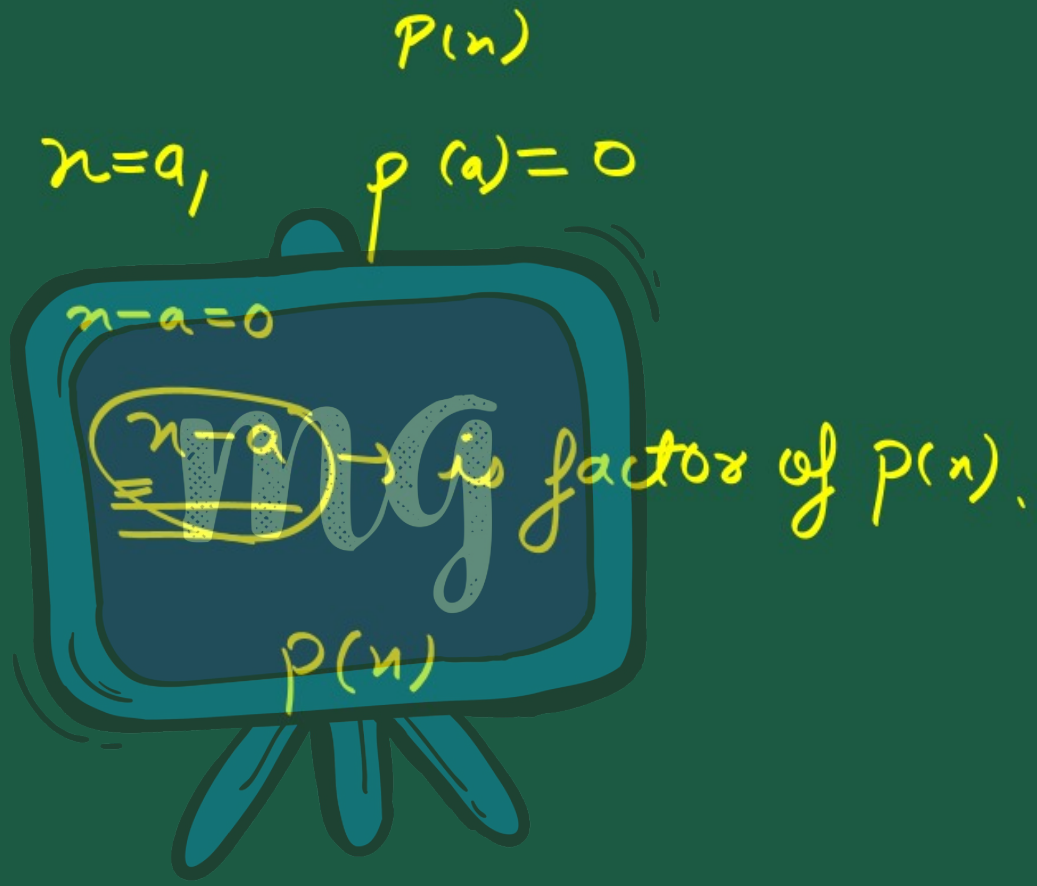

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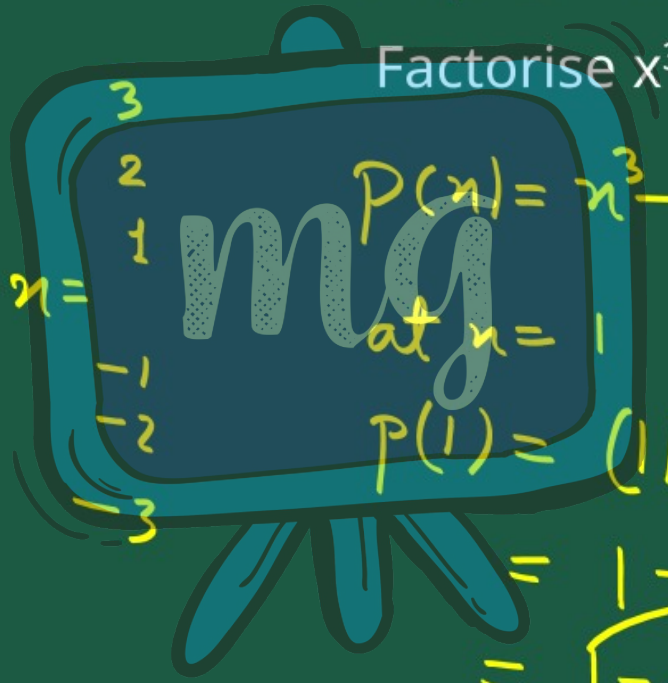
Example : 10

Factorise $x^3 - 23x^2 + 142x - 120$.



$P(x) = x^3 - 23x^2 + 142x - 120$

at $x = 1$

$P(1) = (1)^3 - 23 \times (1)^2 + 142 \times 1 - 120$

$= 1 - 23 \times 1 + 142 - 120$

$= 1 - 23 + 142 - 120$

$= 143 - 143$

$= 0$

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$x = 1,\ P(1) = 0$

$(x-1)$ is factor of $P(x)$.

$x^3 - 23x^2 + 14x - 120$

$x^3 - 23x^2 + 142x - 120 = (x-1) \times Q(x) \times R(x)$

$- (x-1) \times H(x)$

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$$\frac{x^3-23x^2+142x-120}{x-1} = H(x)$$



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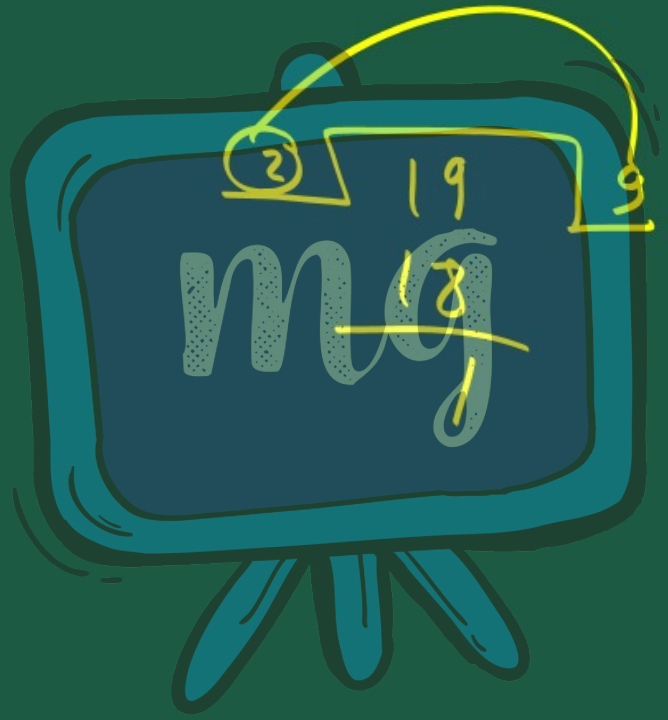

$2 \times 9 = 18$

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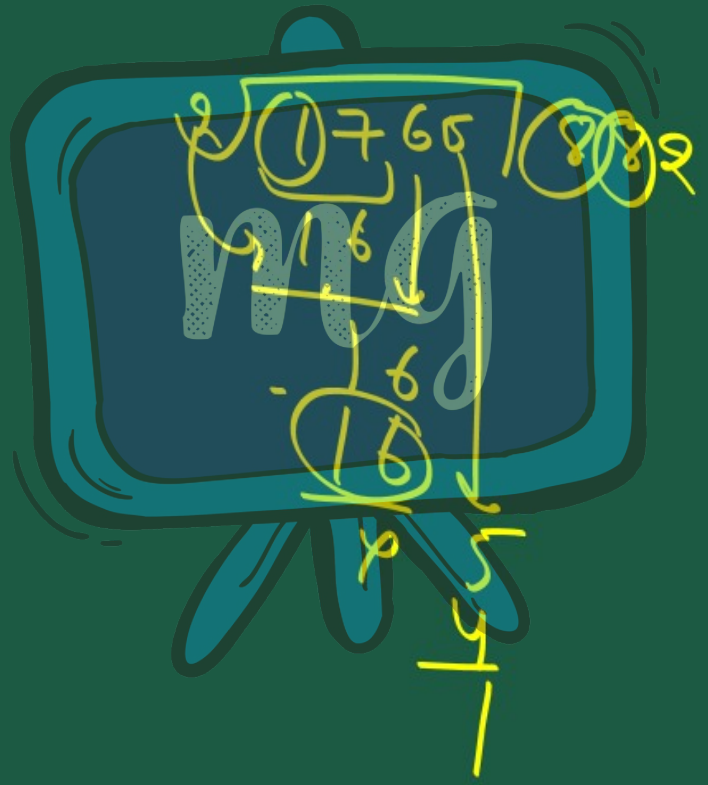

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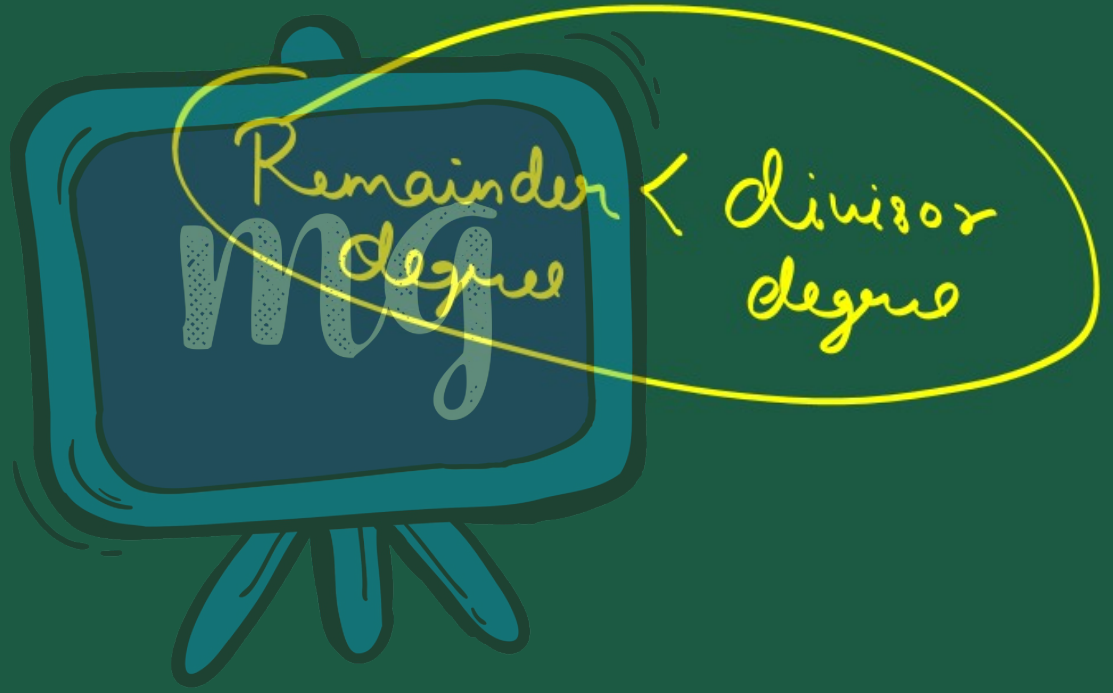

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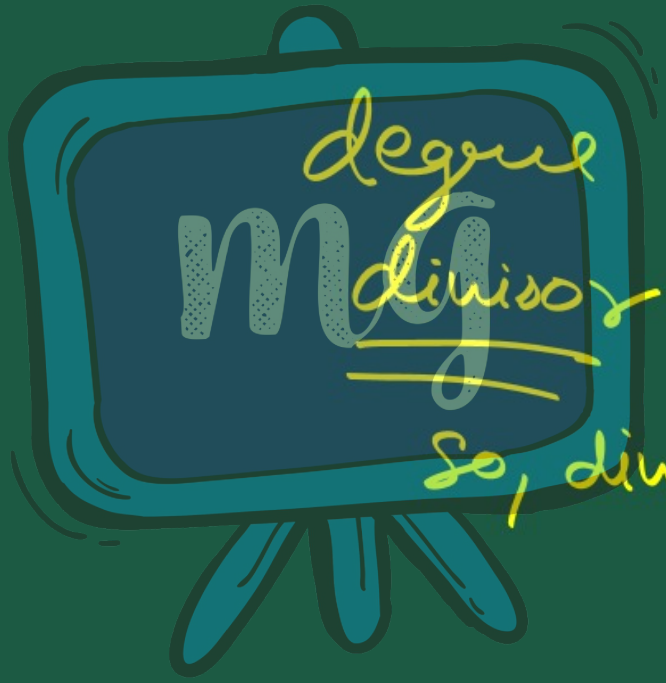

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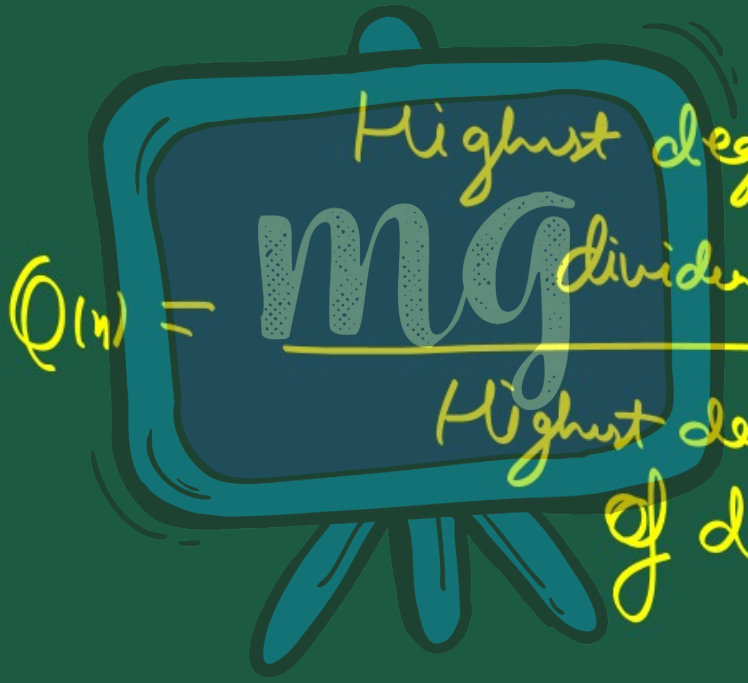

$$Q(x) = \frac{\text{Highest degree term of dividend/Remainder}}{\text{Highest degree term of divisor}}$$

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$x-1$) $x^3-23x^2+142x-120$ ($x^2-22x+120$

x^3-x^2

$-22x^2+142x-120$

$-22x^2+22x$

$120x-120$

$120x-120$

0

$\frac{120x}{x}$

120

Highest degree dividend $\rightarrow -22x^2$

divisor highest degree $= x$

$\frac{-22x^2}{x} = -22x$

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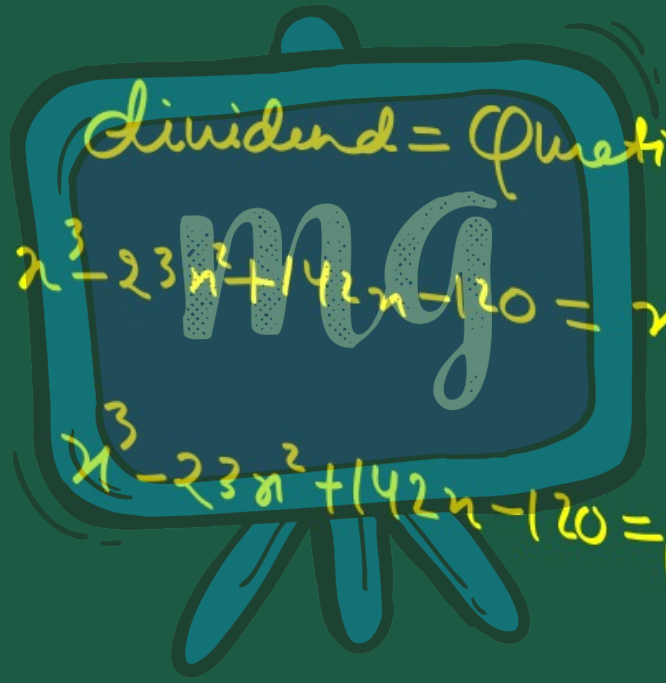

dividend = Quotient × divisor + Remainder

$x^3 - 23x^2 + 142x - 120 = x^2 - 22x + 120 \times (x - 1)$

$+ 0$

$x^3 - 23x^2 + 142x - 120 = (x - 1) \times (x^2 - 22x + 120)$

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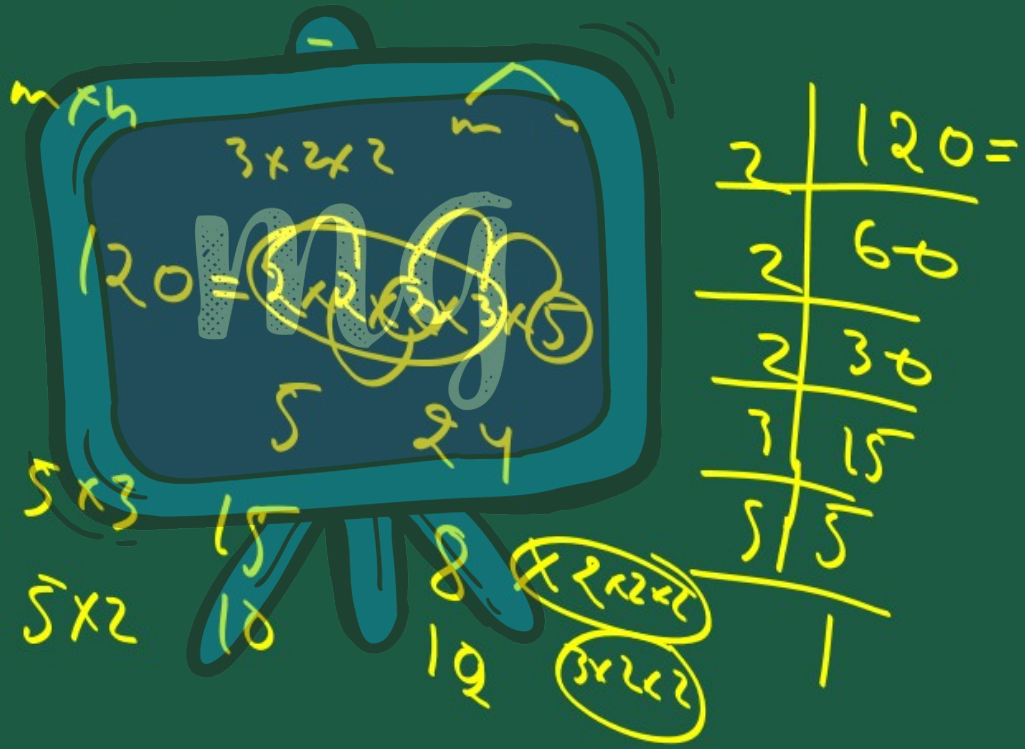
$= (x-1) \times (x^2 - 22x + 120)$



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$$= (n-1) \times (n^2 - 22n + 120)$$

$$= (n-1) \times (n^2 - 12n - 10n + 120)$$

$$= (n-1)[n(n-12) - 10(n-12)]$$

$$= (n-1) \times [n-12] \, (n-10)$$

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$$x^3 - 23x^2 + 142x - 120 = (x-1)(x-12)(x-10)$$



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LEARNING OUTCOME

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Factorisation of Cubic Polynomial

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ASSESSMENT

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1 Factorise the given polynomial $x^3 - 2x^2 - x + 2$.

$P(x) = x^3 - 2x^2 - x + 2$

at $x = 1$

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

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

$= 1 - 2 - 1 + 2$

$= 0$

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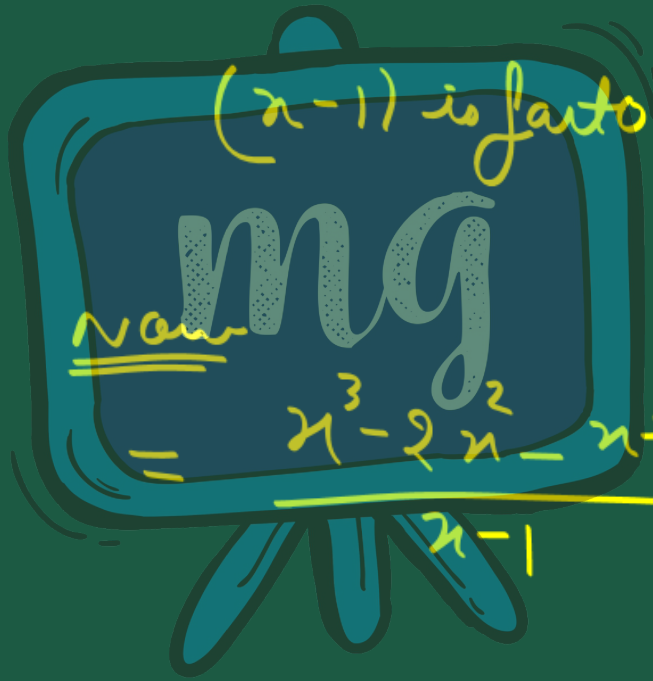
$x = 1$, $p(1) = 0$

$(x-1)$ is factor of polynomial

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



Now

$$= \frac{x^3 - 2x^2 - x + 2}{x - 1}$$

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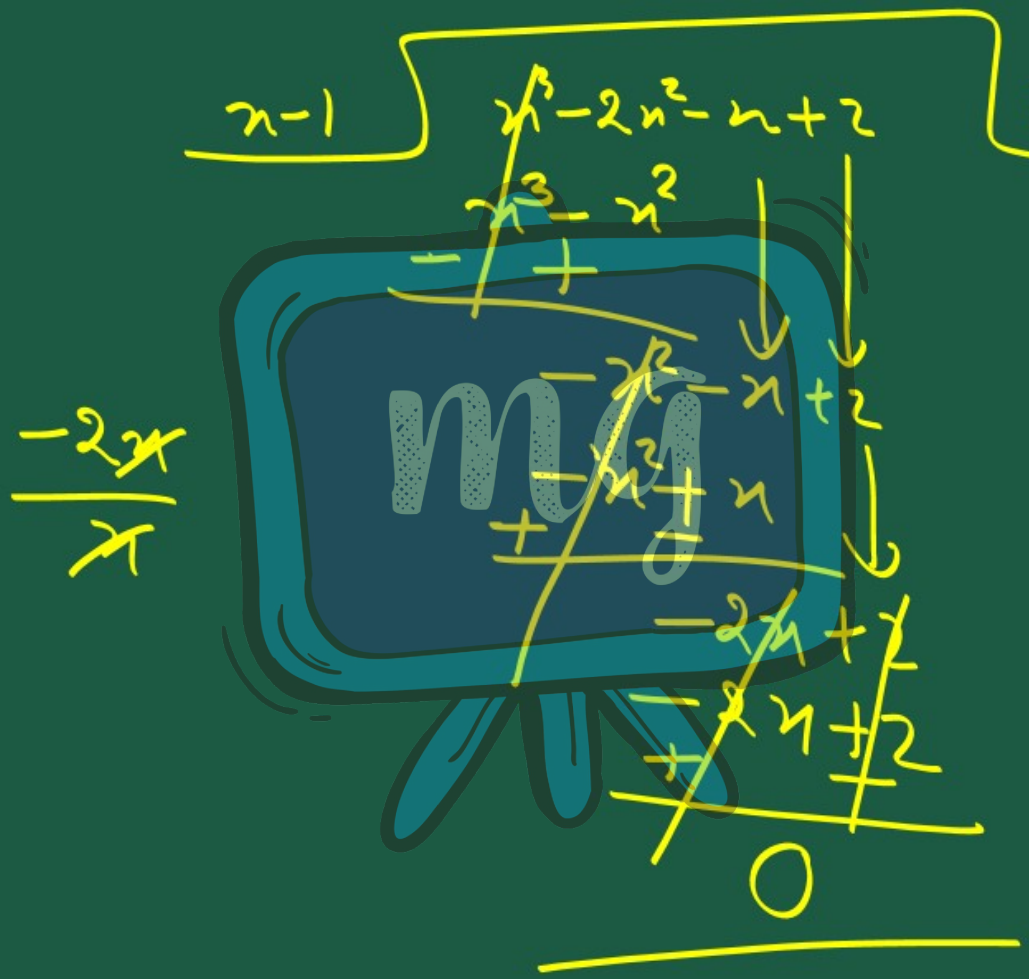

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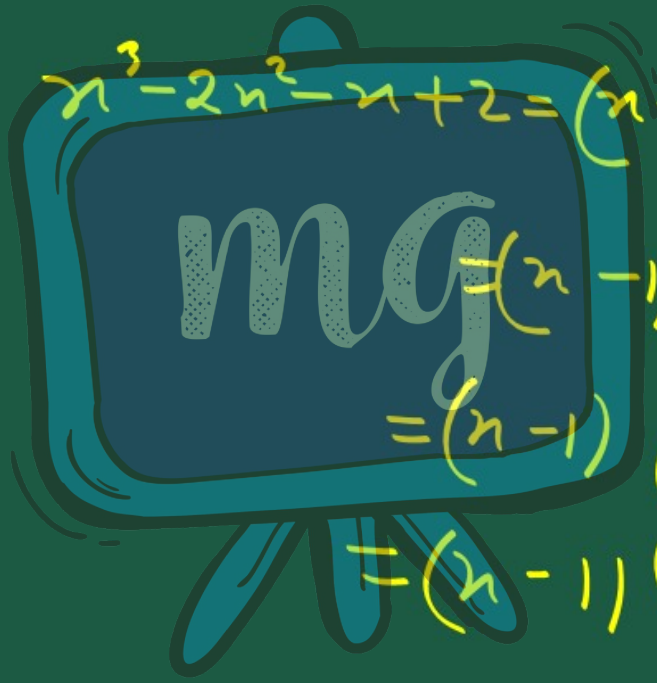
$-2+1=-1$

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

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

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

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



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