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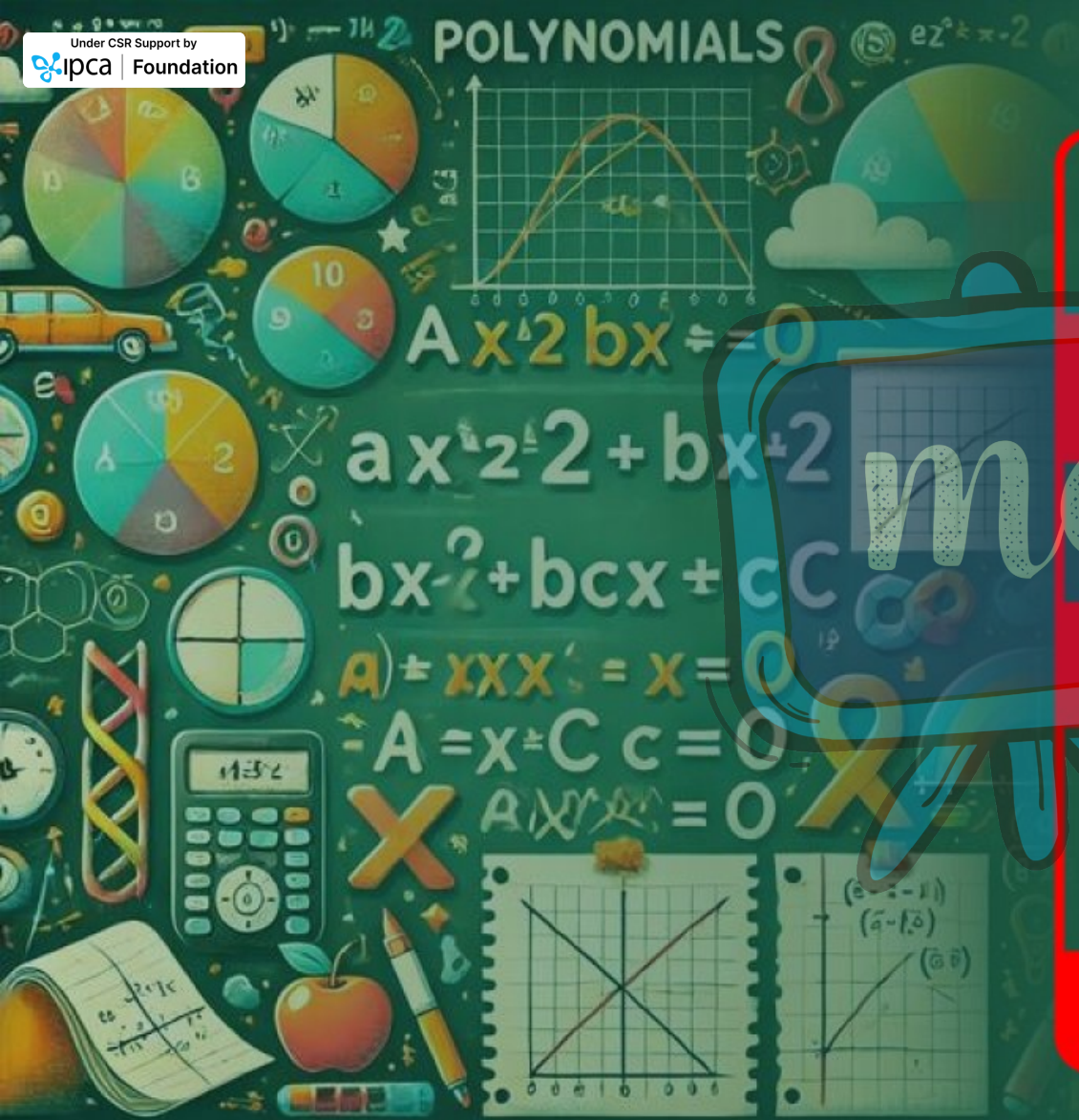

CLASS – 9

MATHS

Chapter - 2

Polynomials

Part – 11

Exercise 2.3 (Question-5)

Vikas Saini

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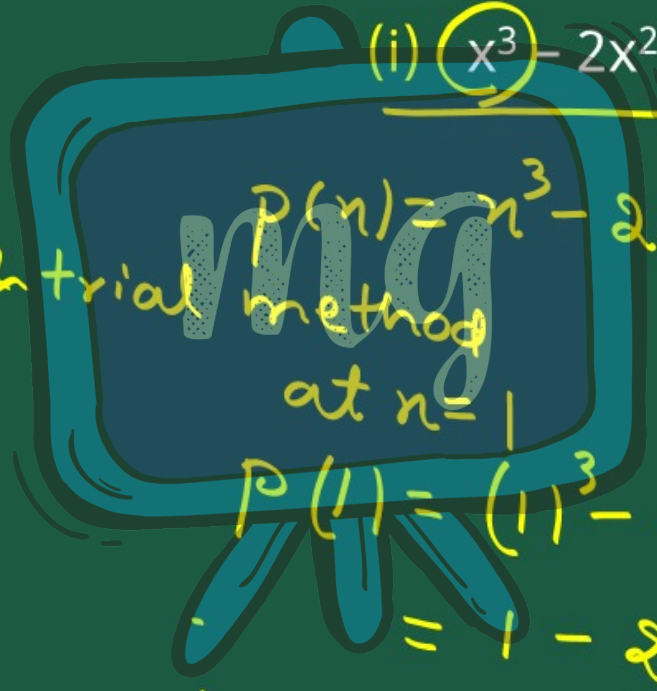
5. Factorise :

(i) $x^3 - 2x^2 - x + 2$ → degree = 3



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

by Hit & trial method

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

$= x^3 - 2x^2 - x + 2$

$\therefore$ Since $P(x)$ is cubic Polynomial

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

$P(x) = (x-1) \times Q(x) \times R(x)$

$$\frac{P(x)}{(x-1)} = Q(x) \times R(x)$$

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$$x-1 \;\big)\; x^3-2x^2-x+2 \;\big(\; x^2-x-2$$

$$x^3-x^2$$

$$-\quad +$$

$$-x^2-x+2$$

$$-x^2+x$$

$$+\quad -$$

$$-2x+2$$

$$-2x+2$$

$$+\quad -$$

$$0$$

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

$$-2(x-1)$$

$$-2x+2$$

Highest degree term of dividend / Remainder

Highest degree term divisor

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

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

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

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

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

$2 = 1 \times 2$

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



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(ii) $x^3 - 3x^2 - 9x - 5$

$p(x) = x^3 - 3x^2 - 9x - 5$

By hit & trial method

$(x - a)$ at $x = 1$

$p(1) = (1)^3 - 3 \times (1)^2 - 9 \times 1 - 5$

$= 1 - 3 - 9 - 5$

$= 1 - 17$

$p(1) = -16$

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at $x = -1$

$p(-1) = (-1)^3 - 3\times(-1)^2 - 9\times(-1) - 5$

$= -1 - 3\times 1 + 9 - 5$

$= -1 - 3 + 9 - 5$

$= -9 + 9$

$= 0$

$(x+1)$



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$(x+1)$ is factor of given polynomial

$$= \frac{P(x)}{x+1}$$

$$= \frac{x^3 - 3x^2 - 9x - 5}{x+1}$$

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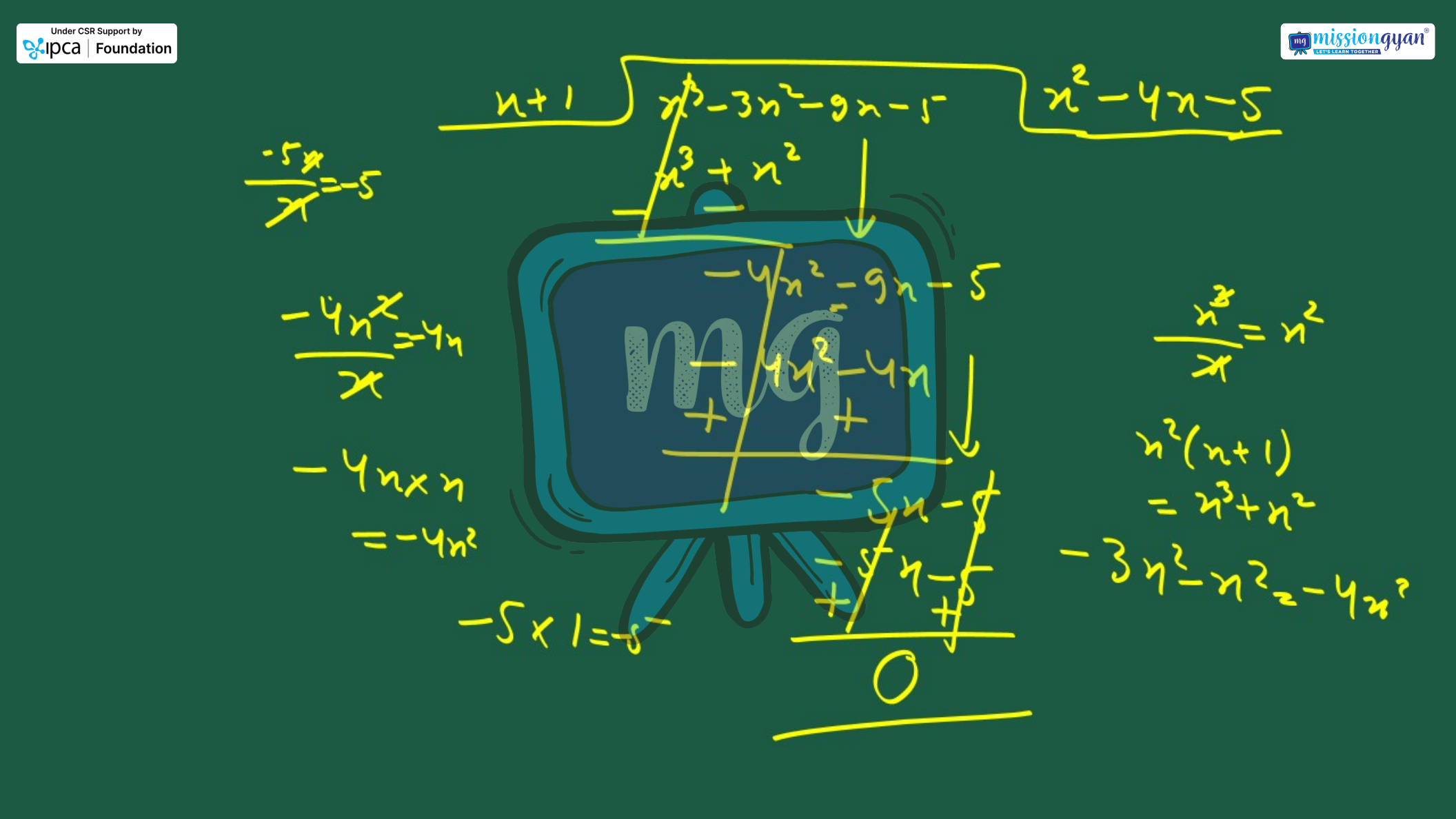

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$$x^3 - 3x^2 - 9x - 5 = (x+1) \times (x^2 - 4x - 5) + 0$$

$$= (x+1)(x^2 - 4x - 5)$$

$$= (x+1)(x^2 - 5x + x - 5) \quad (1 \times -5 = -5)$$

$$= (x+1)\left[x(x-5) + 1(x-5)\right]$$

$$= (x+1)(x-5)(x+1)$$

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$$x^3 - 3x^2 - 9x - 5 = (x+1)(x-5)(x+1)$$



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(iii) $x^3 + 13x^2 + 32x + 20$

$P(x) = x^3 + 13x^2 + 32x + 20$

By hit and trial method

$(x-1)$ at $x=1$, $P(1) = (1)^3 + 13\times(1)^2 + 32\times1 + 20$

$= 1 + 13\times1 + 32 + 20$

$= 1 + 13 + 32 + 20$

$= 14 + 52$

$= 66$

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Let $x=-1$,

$p(-1) = (-1)^3 + 13\times(-1)^2 + 32\times(-1) + 20$

$(x+1)$

$= (-1) + 13\times 1 - 32 + 20$

$= -1 + 13 - 32 + 20$

$= -33 + 33$

$= 0$



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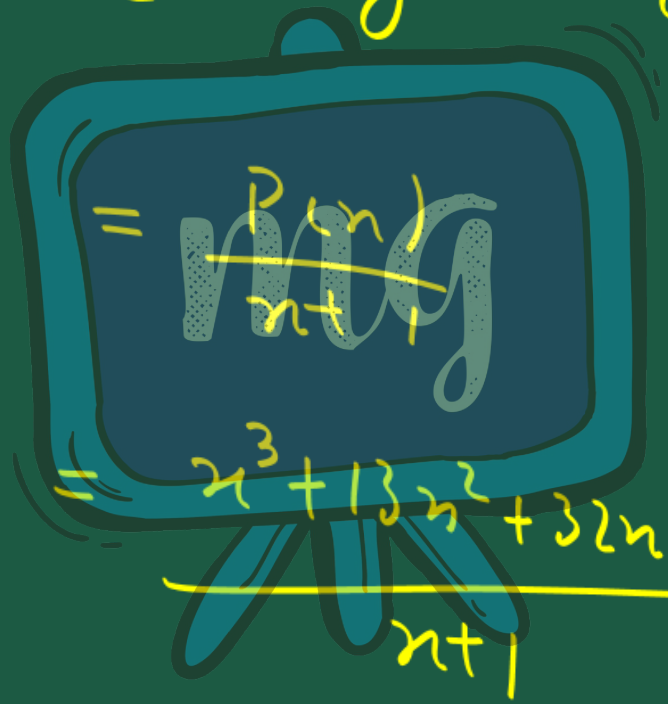
$(x+1)$ is factor of $p(x)$



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

$$= \frac{x^3+13x^2+32x+20}{x+1}$$

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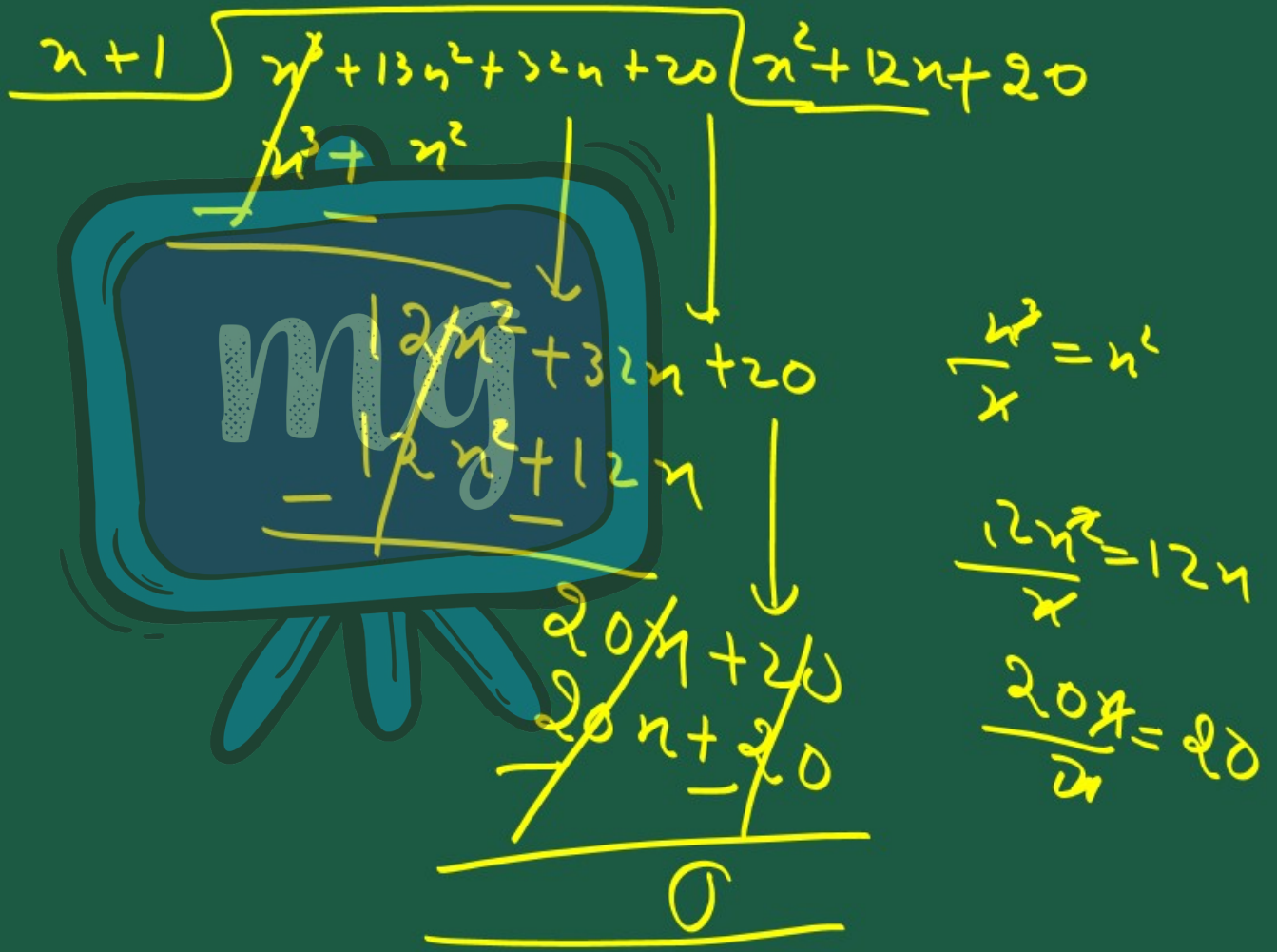

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$$x^3+13x^2+32x+20=(x+1)\times(x^2+12x+20)$$

$1\times 20=20$

$20=1\times 2\times 2\times 5$

$2 \quad 10$

$=(x+1)\ (x^2+12x+20)$

$=(x+1)\ (x^2+10x+2x+20)$

$=(x+1)\ (x(x+10)+2(x+10)$

$=(x+1)(x+2)(x+10)$

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(iv) $2y^3 + y^2 - 2y - 1$

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

By hit-n-trial method

at $y = 1$

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

$= 2 + 1 - 2 - 1$

$= 0$

$(y - 1)$

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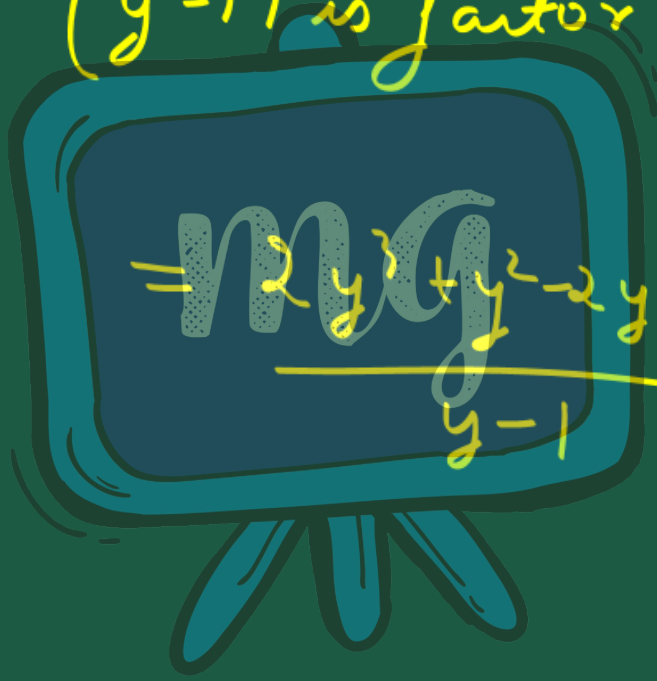
$(y-1)$ is factor of $2y^3+y^2-2y-1$



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

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$y-1$ | $2y^3+y^2-2y-1$ | $2y^2+3y+1$

$2y^3-2y^2$

$-y+y$

$3y^2-2y-1$

$-3y^2-3y$

$+y-1$

$y-1$

0

$\frac{y}{y}=1$

$\frac{2y^2}{y}=2y^2$

$\frac{3y^x}{y}=3y$

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

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

$$=(y-1)\times[2y(y+1)+1(y+1)]$$

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