

$$a, \dots, T_r, b \rightarrow A.P.$$

$$\frac{\sum x_i}{4} \geq \frac{4}{\sum \frac{1}{x_i}}$$

A.P.  $\frac{1}{a}, \frac{1}{T_{n-r+1}}, \dots, \frac{1}{b}$   $T_r = a + (r-1)\left(\frac{b-a}{n-1}\right) = \frac{(n-r)a + (r-1)b}{n-1}$   $\sum x_i, \sum \frac{1}{x_i} \geq 16$

$\underbrace{\frac{1}{T_{n-r+1}}, \dots, \frac{1}{b}}_{n \text{ terms}}$

$T_{n-r+1} T_r = ab$

$-p = \sum x_i$

$-r = \sum x_1 x_2 x_3$

$-r = \sum x_1 x_2 x_3 x_4 \left(\sum \frac{1}{x_i}\right)$

$-r = 5 \left(\sum \frac{1}{x_i}\right)$

$$\frac{1}{T_{n-r+1}} = \frac{1}{a} + (n-r)\left(\frac{\frac{1}{b} - \frac{1}{a}}{n-1}\right) = \frac{(n-r)(a-b)}{(n-1)ab} + \frac{1}{a}$$

$pr = 5 \left(\sum \frac{1}{x_i} \sum x_i\right) \geq 5(16)$

$-r = 5 \left(\sum \frac{1}{x_i}\right)$

$$\frac{(r-1)b + (n-r)a}{(n-1)ab} =$$

$$x^4 + px^3 + qx^2 + rx + 5 = 0$$

$x_1 x_2 x_3 x_4 = 5$

$\begin{matrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{matrix}$

$$\sqrt[3]{\frac{x}{\beta} \cdot \frac{2}{\beta}} = \frac{1}{\beta} + \frac{2}{\beta} = \left( \frac{1}{2} + \frac{1}{\gamma} + \frac{1}{\beta} \right) = \frac{-54}{27} = -2$$

$$\beta = -\frac{3}{2} \checkmark$$

$$2000x^3 - \frac{2}{x^3} + 100x^2 + \frac{1}{x^2} + 10 = 0$$

$$c = ?$$

$$2 \left( \left( 10x - \frac{1}{x} \right)^3 + 30 \left( 10x - \frac{1}{x} \right) \right) + \left( \left( 10x - \frac{1}{x} \right)^2 + 20 \right) + 10 = 0 \quad (2x+3)$$

$$2t^3 + t^2 + 60t + 30 = 0$$

$$(t^2 + 30)(2t + 1) = 0$$

$$2 \left( (10x^2)^3 - 1^3 \right) + x \left( 100x^4 + 10x^2 + 1 \right)$$

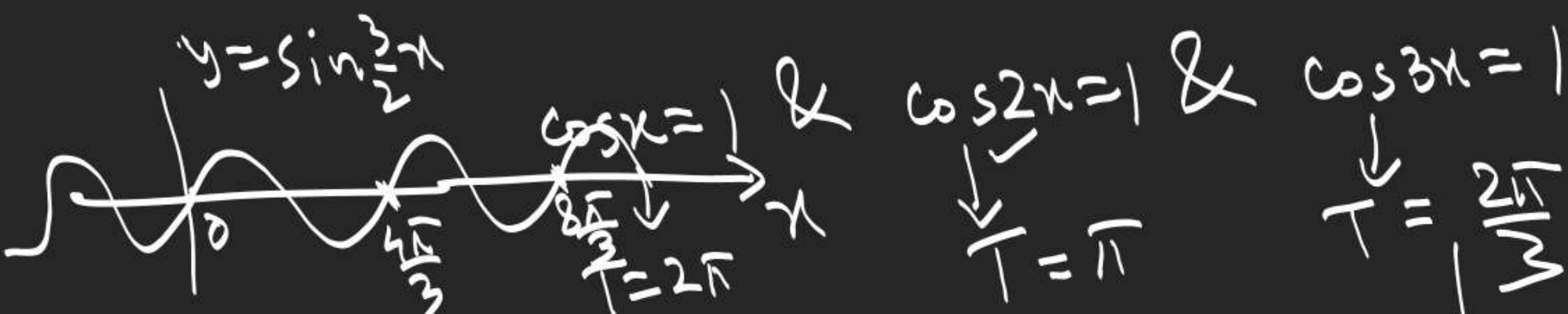
$$\Rightarrow (100x^4 + 10x^2 + 1) (20x^2 - 2 + x) = 0$$

$$1^3 + 2^3 + \dots + 9^3 = 2 \left( 2^3 + 4^3 + 6^3 + 8^3 \right)$$

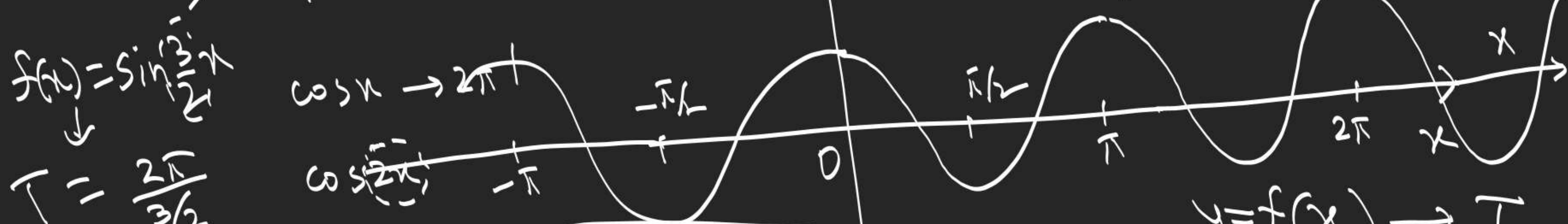
$$\left( 1^3 + \dots + 9^3 \right) = 16 \left( 1^3 + 2^3 + 3^3 + 4^3 \right)$$

$$\left( \frac{9 \times 10}{2} \right)^2 = 16 \left( \frac{4 \times 5}{2} \right)^2$$

1.  $\cos x + \cos 2x + \cos 3x = 3$



$y = \cos 2x$



$2x = \theta \rightarrow 2\pi$   
 $x \rightarrow \pi$

$f(x) = \tan 6x$

$T = \frac{\pi}{6}$

$y = f(x) \rightarrow T$

$y = \cos 3x$        $y = f(kx) \rightarrow \frac{T}{k}$

$T = \frac{2\pi}{3}$        $T = \frac{2\pi}{3 \cdot 1} = \frac{2\pi}{3}$

$$\left. \begin{array}{l} f_1(x) \rightarrow T_1 \\ f_2(x) \rightarrow T_2 \end{array} \right\} \text{common length of repetition}$$

$$= 2T_1 = 5T_2$$

$$= \text{LCM of } T_1, T_2$$

$$f_1 \rightarrow T_1, 2T_1, 3T_1, 4T_1, 5T_1, \dots$$

$$f_2 \rightarrow T_2, 2T_2, 3T_2, 4T_2, 5T_2, 6T_2, 7T_2, \dots$$

$$\boxed{6\pi} = \frac{2\pi}{5} \times 15 = \text{LCM} = \frac{2\pi}{5} n_1 = \frac{3\pi}{4} n_2 \Rightarrow \begin{array}{l} 8n_1 = 15n_2 \\ (n_1)_{\text{least}} = 15, n_1 \in \mathbb{N} \end{array}$$



$$\boxed{18 \times 2} = \text{LCM} = 18n_1 = 12n_2$$

$$\text{LCM of } (18, 12)$$

$$\begin{array}{l} 18n_1 = 12n_2 \\ 3n_1 = 2n_2 \\ (n_1)_{\text{least}} = 2 \end{array}$$

$$\text{LCM of } \left( \frac{18\pi}{5}, \frac{3\pi}{4} \right)$$

$$\frac{\text{LCM of } N_r}{\text{HCF of } D_r}$$

$$\cos x + \cos 2x + \cos 3x = 3$$

$$\cos x = 1 \quad \text{and} \quad \cos 2x = 1$$

$$\downarrow$$

$$\underline{2\pi}$$

$$\downarrow$$

$$\underline{\pi}$$

$$\text{and} \quad \cos 3x = 1$$

$$\downarrow$$

$$\underline{\frac{2\pi}{3}}$$

$$T = 2\pi$$

$$[0, 2\pi)$$

$$x = 0$$

$$x = 2n\pi + 0, \quad n \in \mathbb{I}$$

$$\underline{2.} \quad \underline{\sin x} \left( \underline{\cos \frac{x}{4}} - 2 \sin x \right) + \left( 1 + \underline{\sin \frac{x}{4}} - 2 \cos x \right) \underline{\cos x} = 0$$

$$\sin \frac{5x}{4} - 2 + \cos x = 0$$

$$\sin \frac{5x}{4} + \cos x = 2$$

$$x \in [0, 8\pi)$$

$$\cancel{0}, \check{2\pi}, \cancel{4\pi}, \cancel{6\pi}$$

$$\sin \frac{5x}{4} = 1$$

$$\downarrow$$

$$T = \frac{8\pi}{5}$$

$$\& \cos x = 1$$

$$\downarrow$$

$$T = 2\pi$$

$$x = 8n\pi + 2\pi, n \in \mathbb{I}$$

$$\frac{5\pi}{2} = 8\pi - \frac{\pi}{2}$$

$$\frac{2\pi}{5/2}$$

$$\text{LCM} = \frac{8\pi}{5} n_1 = 2\pi n_2 = \frac{8\pi}{5} \times 5 = 8\pi$$

$$4n_1 = 5n_2$$

$$(n_1)_{\min} = 5$$

3. Solve for  $x$  &  $y$  satisfying the eqn.

$$2 - (x+1)^2 = \underbrace{1 - 2x - x^2}_{\leq 2} = \underbrace{\tan^2(x+y) + \cot^2(x+y)}_{\geq 2}$$

$$x = -1, y = n\pi + 1 \pm \frac{\pi}{4}, n \in \mathbb{I}$$



$$x = -1 \quad \& \quad \tan^2(x+y) = 1$$

$$\tan^2(y-1) = 1$$

$$y-1 = n\pi \pm \frac{\pi}{4}$$

3.  $\sqrt{1 - \cos x} = \sin x$

$$1 - \cos x = \sin^2 x = (1 - \cos x)(1 + \cos x)$$

$$1 - \cos x = 0 \text{ or } 1 + \cos x = 1$$

$$\cos x = 1, \cos x = 0$$

$$-4 \neq 4$$

$$16 = 16$$

$$\cos x = 1$$

$$\cos x = 0 \ \& \ \sin x = 1$$

$$\sum x - \text{II} \quad (6 - 10)$$

$$\sum x - \text{III} \quad (11 - 28)$$

$$x = 2n\pi + \frac{\pi}{2}, 2n\pi, n \in \mathbb{I}$$