Nishant Jindal

$$\sum_{r=1}^{n} \frac{r^2}{(r+1)(r+2)} 4^r = \sum_{r=1}^{n} \left(\frac{(r+1)(r+2) - (3r+2)}{(r+1)(r+2)}\right) 4^r$$

$$4(r+1)-(r+2)$$

$$= \sum_{r=1}^{n} 4^r - \sum \frac{(3r+2)}{(r+1)(r+2)} 4^r$$

$$(r-1)r(r+1)(r+2 \; -2)$$

$$= \frac{4(4^n-1)}{(4-1)} - \sum_{r=1}^{n} \left(\frac{4^{r+1}}{(r+2)} - \frac{4^r}{r+1}\right)$$

$$r=n \qquad r=1$$

$$\sum (r^4 - r^2) + \sum r^2$$

$$S = 1 + 4 + 9 + 16 + \dots T_n$$

$$S =$$

$$\frac{4(4^n-1)}{3} - \left(\frac{4^{n+1}}{n+2} - \frac{4}{2}\right)$$

$$\sum_{r=1}^{n} r^2(r^2+r+1)$$

$$T_n = \underbrace{1+3+5+7+\dots}_{n}$$

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$$\sum_{r=1}^{n} \frac{(r^2+1)}{r(r+1)} 2^{r-1} = \sum_{r=1}^{n} \frac{r^2+r-r+1}{\underbrace{r^2+r}_{r(r+1)}} 2^{r-1}$$

$$= \sum_{r=1}^{n} 2^{r-1} - \sum \frac{2r-(r+1)}{r(r+1)} 2^{r-1}$$

$$\sum_{r=1}^{n} \frac{r \cdot 2^{r}}{(r+2)!} \quad \text{+2 −2} = \sum_{r=1}^{n} \left(\underbrace{\frac{2^r}{(r+1)!}}_{r=1} - \underbrace{\frac{2^{r+1}}{(r+2)!}}_{r=n} \right)$$

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$$180^\circ(n-2) = \frac{n}{2}\left(240+(n-1)5\right)$$

$n = 7, 16, 9$

$0 + (n-1)5$

$$\frac{\log_x m}{\log_x k}\left(\log_x kn\right) =$$

$$\log_x (kn)^{\log_k m} = \log_x n^2$$

$$\log_x (n^2)$$

$$\frac{1}{\log_x k} + \frac{1}{\log_x n} = \frac{2}{\log_x m}$$

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$$S_{3n} = S_{4n} - S_{3n}$$

$$\frac{S_{2n}}{S_{4n} - S_{2n}}$$

$$2\,\frac{3n}{2}\left(2a + (3n-1)d\right) = \frac{4n}{2}\left(2a + (4n-1)d\right)$$

$$2\sin 2^\circ + 4\sin 4^\circ + \cdots + 176\sin 176^\circ + 178\sin 178^\circ + 180\sin 180^\circ$$

$$180\left(\sin 2^\circ + \sin 4^\circ + \cdots + \sin 88^\circ\right) + 90$$

90

90

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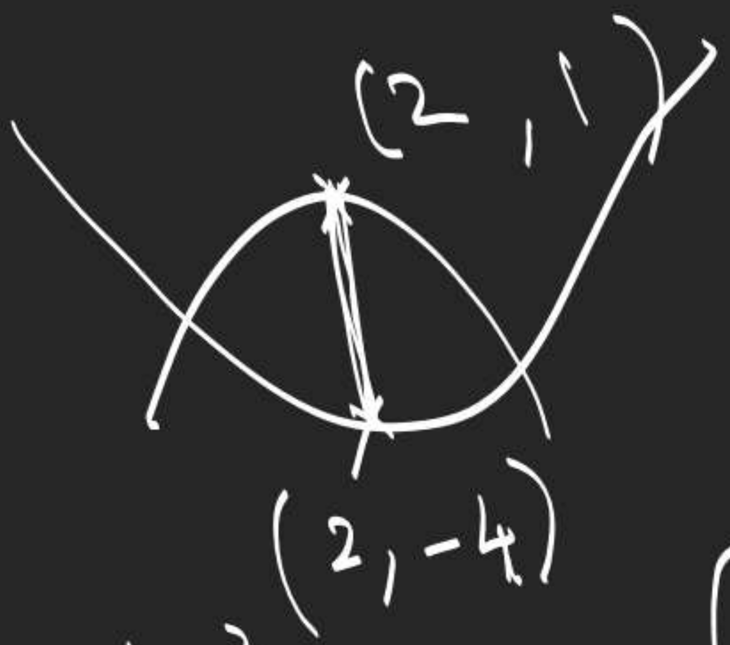

$$(x-1)\underbrace{(x^2-7x+13)}_{P}$$

$\boxed{x=2}$ $\boxed{x=4,3}$

$\boxed{a+\frac{1}{a}=3}$ P

$$\left(a+\frac{1}{a}\right)^3-3\left(a+\frac{1}{a}\right)=18$$

$$t^3-3t-18=0$$

$$(t-3)(t^2+3t+6)=0$$

$$\alpha+\beta=-\frac{a+3}{a}=-1-\frac{3}{a}$$

$$\alpha\beta=\frac{a-3}{a}=1-\frac{3}{a}$$

$$-(x^2-4x+3)$$

$$\alpha\beta-(\alpha+\beta)=2$$

$$\underbrace{(\alpha-1)}_{3}\underbrace{(\beta-1)}_{1}=3$$

$$(\alpha,\beta)=(4,2),\ (2,4)$$

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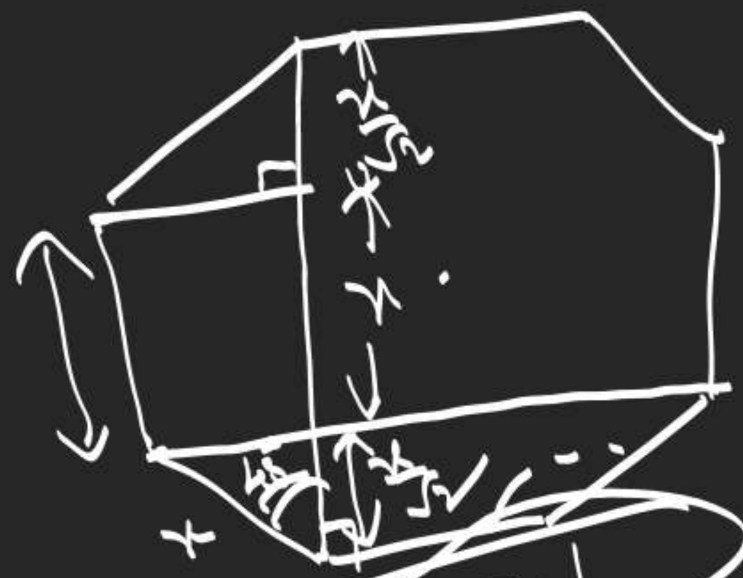
$$(9^t-3)(3^t-9)(9^t+3^t-12)=0.$$



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

$(\sqrt{2}-2)\pi$

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1. $\sin x + \cos x = \sqrt{2}$

$\sqrt{2}\cos\left(x - \frac{\pi}{4}\right) = \sqrt{2}$

$x - \frac{\pi}{4} = 2n\pi$

$\boxed{x = 2n\pi + \frac{\pi}{4},\ n \in I}$

$\sin\left(x + \frac{\pi}{4}\right) = \underline{\underline{1}}$ $\quad x + \frac{\pi}{4} = n\pi + (-1)^n \frac{\pi}{2}$

$x + \frac{\pi}{4} = 2n\pi + \frac{\pi}{2}$

$x = 2n\pi + \frac{\pi}{4}$

2. $\sqrt{3}\cos x + \sin x = 2$

$2\cos\left(x - \frac{\pi}{6}\right) = 2$

$x - \frac{\pi}{6} = 2n\pi$

$x = 2n\pi + \frac{\pi}{6},\ n \in I$

3. $\sin x + \cos x = \frac{3}{2}$

ϕ

4. $(\sec x - 1) = (\sqrt{2}-1)\tan x$

$$(1-\cos x) = (\sqrt{2}-1)\sin x$$

$$\frac{1-\cos x}{\sin x} = \sqrt{2}-1$$

$$\tan\frac{x}{2} = \sqrt{2}-1$$

$$\frac{x}{2} = n\pi + \frac{\pi}{8}$$

or

$$\frac{(\sqrt{2}-1)}{\sqrt{(\sqrt{2}-1)^2+1}}\sin x + \frac{1}{\sqrt{(\sqrt{2}-1)^2+1}}\cos x = \frac{1}{\sqrt{(\sqrt{2}-1)^2+1}}$$

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

$2n\pi + 0, \; n \in I.$

5. $1 + \sin^3 x + \cos^3 x = \frac{3}{2}\sin 2x$

$$\sin^3 x + \cos^3 x + 1^3 = 3\sin x\cos x(1)$$

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

or $\sin x = \cos x = 1$

$$\cos\left(x - \frac{\pi}{4}\right) = -\frac{1}{\sqrt{2}}$$

$$\boxed{x - \frac{\pi}{4} = 2n\pi \pm \frac{3\pi}{4}}$$

$n \in I.$

$$\cos\left(x - \frac{\pi}{8}\right) = \frac{1}{\sqrt{(\sqrt{2}-1)^2+1}} = \cos\frac{\pi}{8}$$

$$\boxed{x - \frac{\pi}{8} = 2n\pi \pm \frac{\pi}{8}}$$

$$x = 2n\pi + \frac{\pi}{4}$$

$$\boxed{x = 2n\pi + \frac{\pi}{4}, \; 2n\pi, \; n \in I.}$$

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6.

$x \in \left(0, \frac{\pi}{2}\right)$

$\sin x = \frac{1}{3}$

$\boxed{x \in \left(0, \frac{\pi}{2}\right)}$

$\pi + \sin^{-1}\frac{1}{3}$

$x = \sin^{-1}\frac{1}{3}$

$x \in \left(0, \frac{\pi}{2}\right)$ $\tan x = 3$

$x = \tan^{-1} 3$

$\sin^{-1}\frac{1}{3}$

$x = \left(\frac{3\pi}{2}, 2\pi\right)$

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

$\left(\pi, \frac{3\pi}{2}\right)$

$x = ?$

$2\pi - \sin^{-1}\frac{1}{3}$

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6. $3\sqrt{3}\sin^3 x + \cos^3 x + 3\sqrt{3}\sin x\cos x = 1$

$$(\sqrt{3}\sin x)^3 + (\cos x)^3 + (-1)^3 = 3.(\sqrt{3}\sin x)(\cos x)(-1)$$

$\sqrt{3}\sin x + \cos x - 1 = 0$ or $\cancel{\sqrt{3}\sin x = \cos x = -1}$

2 pm

PT-3,4

$\{x - I\}(1-10)$

$$2\cos\left(x - \frac{\pi}{3}\right) = 1$$

$$x - \frac{\pi}{3} = 2n\pi \pm \frac{\pi}{3}$$

$$x = 2n\pi + \frac{2\pi}{3},\ 2n\pi\ ;\ n \in I$$