Nishant Jindal

229(b)

21, 23, 25, 26, 29,

30, 31

Factorial

$\lfloor n = n! = n(n-1)! \rfloor$

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Trigonometric Eqn

$\sin\theta = \frac{1}{2}$

all values of θ

General Solution (all values)

$\theta = 2n\pi + \frac{\pi}{6}, 2n\pi + \frac{5\pi}{6}, n \in I$

$\sin\theta = 1/2$

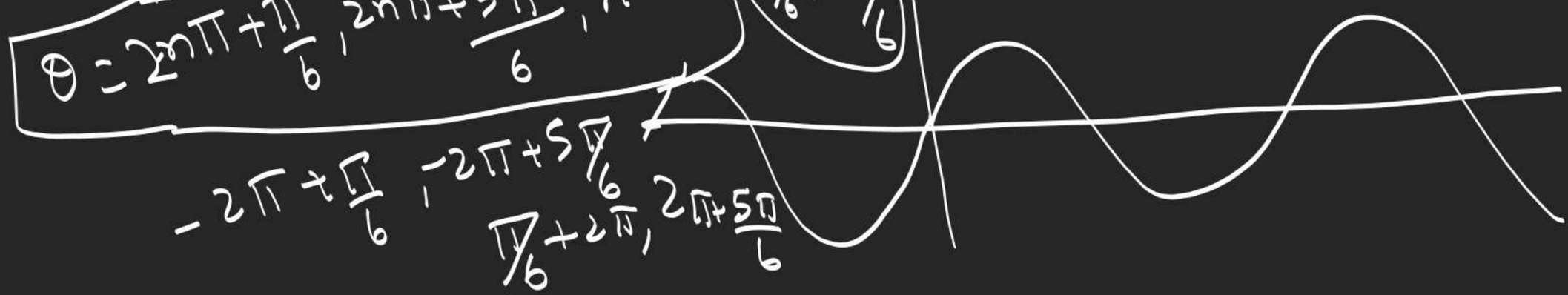
$\pi/6, 5\pi/6$

$-2\pi + \frac{\pi}{6}, -2\pi + \frac{5\pi}{6}$

$\pi/6 + 2\pi, 2\pi + \frac{5\pi}{6}$

Principle solution

$\theta \in [0, 2\pi)$



$\sin\theta = \frac{1}{2} = \sin\alpha$

$\theta = n\pi + (-1)^n \frac{\pi}{6}$, $n \in I$

General sol^n

$\sin\theta = \sin\alpha$

$\theta = n\pi + (-1)^n \alpha$, $n \in I$

$\sin\theta - \sin\alpha = 0$

$2 \sin\frac{\theta-\alpha}{2} \cdot \cos\frac{\theta+\alpha}{2} = 0$

$\sin\frac{\theta-\alpha}{2} = 0$ OR $\cos\frac{\theta+\alpha}{2} = 0$

$\frac{\theta-\alpha}{2} = n\pi$

$\theta = 2n\pi + \alpha$, $n \in I$

OR

$\frac{\theta+\alpha}{2} = (2n+1)\frac{\pi}{2}$

$\theta = (2n+1)\pi - \alpha$, $n \in I$

$\cos\theta = \cos\alpha$

$\cos\theta - \cos\alpha = 0 \Rightarrow 2\sin\left(\frac{\theta-\alpha}{2}\right)\cdot\sin\left(\frac{\theta+\alpha}{2}\right) = 0$

$\sin\left(\frac{\theta-\alpha}{2}\right) = 0$ or $\sin\left(\frac{\theta+\alpha}{2}\right) = 0$

$\frac{\theta-\alpha}{2} = n\pi$ $\qquad$ $\frac{\theta+\alpha}{2} = n\pi$

$\theta = 2n\pi + \alpha$ $\qquad$ OR $\qquad$ $\theta = 2n\pi - \alpha$

$$\theta = 2n\pi \pm \alpha, \; n \in I$$

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$\tan\theta = \tan\alpha$

$$\tan\theta - \tan\alpha = 0$$

$$\frac{\sin(\theta-\alpha)}{\cos\theta\cdot\cos\alpha} = 0 \Rightarrow \sin(\theta-\alpha) = 0$$

$$\Rightarrow \theta - \alpha = n\pi$$

$$\Rightarrow \boxed{\theta = n\pi + \alpha,\ n \in I}$$

$\tan x = 1 = \tan\pi/4$

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

General sol^n

$\sin^2\theta = \sin^2\alpha$, $\cos^2\theta = \cos^2\alpha$, $\tan^2\theta = \tan^2\alpha$

$\sin(\theta-\alpha)\cdot\sin(\theta+\alpha) = 0$

$\sin(\theta-\alpha)=0$ or $\sin(\theta+\alpha)=0$

$\theta-\alpha = n\pi$

$\theta = n\pi+\alpha$

$\theta+\alpha = n\pi$

$\theta = n\pi-\alpha$

$\theta = n\pi \pm \alpha$, $n \in I$

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1. Find general sol^n of 'θ' satisfying

$\sin\theta = -\frac{1}{2}$ and $\tan\theta = \frac{1}{\sqrt{3}}$

$[0, 2\pi) \rightarrow \frac{7\pi}{6}$

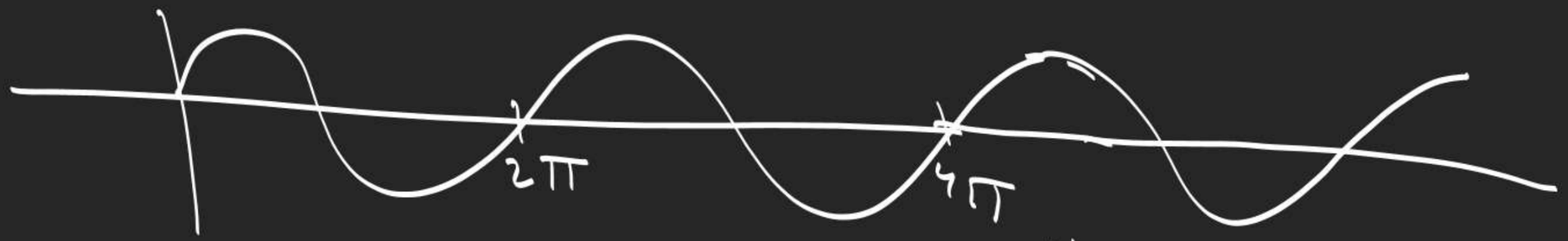
$\sin\theta$: 2π, $\frac{7\pi}{6}$; $\tan\theta$: π

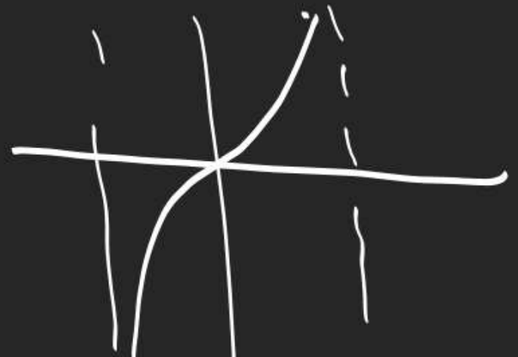
both repeats after 2π

$\theta = 2n\pi + \frac{7\pi}{6}$, $n \in I$

$\sin\theta$ repeats after length of $2\pi, 4\pi, 6\pi, - - -$

$\tan\theta$ —— " —— $\pi, 2\pi, 3\pi, - - -$





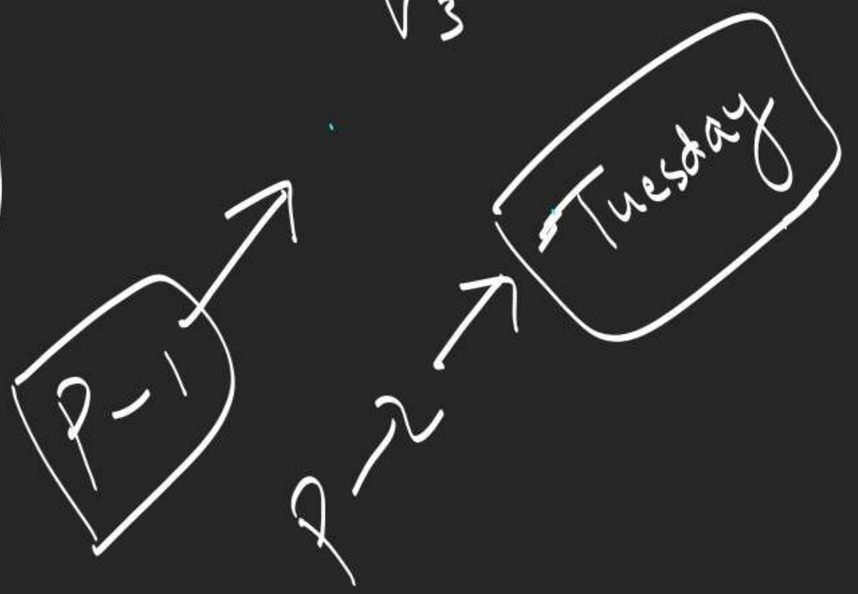
2. Find principle & general Soln. of eqn

$$\sin^2 x + 2\tan^2 x + \frac{4}{\sqrt{3}}\tan x - \sin x + \frac{11}{12} = 0$$

$$\left(\sin x - \frac{1}{2}\right)^2 + 2\left(\tan x + \frac{1}{\sqrt{3}}\right)^2 = 0$$

$$\sin x = \frac{1}{2} \quad \& \quad \tan x = -\frac{1}{\sqrt{3}}$$

$$x = 2n\pi + \frac{5\pi}{6}, \; n \in I$$



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Find general soln. of eqn

3. $(2\sin x - \cos x)(1+\cos x) = \sin^2 x$

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

$(1+\cos x)(2\sin x - 1) = 0$

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

$x = n\pi + (-1)^n \frac{\pi}{6}$, $(2n+1)\pi$, $(2n+1)\frac{\pi}{6}$

$n \in I$

$x = (2n+1)\frac{\pi}{2}$

$n\pi \pm \frac{\pi}{6}$, $n \in I$

4. $2\cos x \cos 2x = \cos x$

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

$3x = (2n+1)\frac{\pi}{2}$

$(2(\cos 2x - 1)\cos x = 0$

$\cos x = 0$, or $\cos 2x = \frac{1}{2}$

$\Rightarrow 2x = 2n\pi \pm \frac{\pi}{3} \Rightarrow x = n\pi \pm \frac{\pi}{6}$

5. $\cot x - \cos x = 1 - \cot x \cdot \cos x$

$\cot x \cdot \cos x + \cot x - \cos x - 1 = 0$

$(\cot x - 1)(\cos x + 1) = 0 \Rightarrow$ $\cos x = -1$ or $\cot x = 1$

$\times$

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

6. $2\sin^3 x + 6\sin^2 x - \sin x - 3 = 0$

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

PT - 1, 2

$\sin^2 x = \frac{1}{2}$

$x = n\pi \pm \frac{\pi}{4}, n \in I$

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7. $\cos 4x + 6 = 7\cos 2x$

$2\cos^2 2x + 5 - 7\cos 2x = 0 = (2\cos 2x - 5)(\cos 2x - 1)$

$-2\cos 2x - 5\cos 2x$

$\cos 2x = \frac{5}{2}$ ✗ , $\cos 2x = 1$

$2x = 2n\pi$

$x = n\pi, \; n \in I$

8. $5\tan^4 x - \sec^4 x = 29$

$5\tan^4 x - (1+\tan^2 x)^2 = 29$

$\tan^2 = t$

$4t^2 - 2t - 30 = 0$

$2t^2 - t - 15 = 0 = (2t+5)(t-3)$

$-6t + 5t$

$\tan^2 x = 3$

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

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