DAY 59

MCA CET 2025

MATHS

TRIGINOMETRIC EQUATIONS

INEXORABLE

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Trigonometric Equations

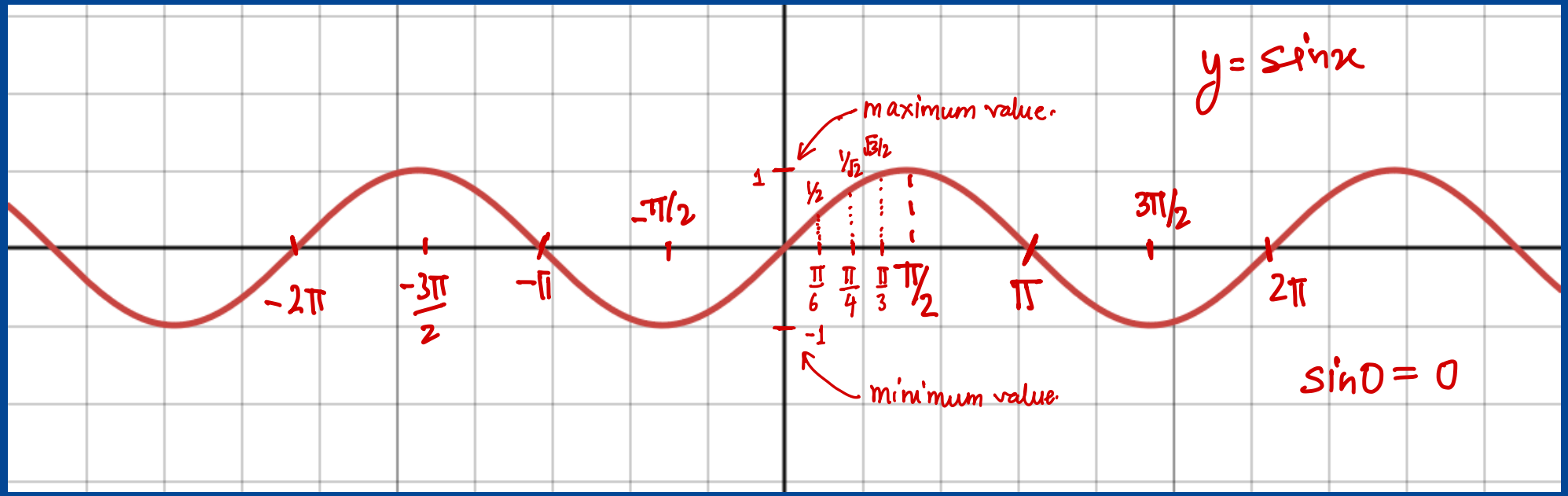
An equation involving one or more trigonometrical ratios of unknown angles is called a trigonometric equations

$$x^2 + 2x + 1 = 0$$

$$\cos^2 x + \cos x + 2 = 0$$

$y = \sin x$ $\pi = 180^\circ$

General Solutions of Trigonometric Eqns.



sin θ.

$\sin\theta = \sin\frac{\pi}{4}$

$\theta = \alpha$

$\sin\theta = 0$	$\Rightarrow \theta = n\pi, n \in I$
$\sin\theta = 1$	$\Rightarrow \theta = \frac{(4n+1)\pi}{2}, n \in I$
$\sin\theta = -1$	$\Rightarrow \theta = \frac{(4n+3)\pi}{2}, n \in I$
$\sin\theta = \sin\alpha$	$\Rightarrow \theta = n\pi + (-1)^n\alpha, \quad n \in I, \quad \alpha \in \left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

$n\pi + (-1)^n \frac{\pi}{4}$

General Solutions of Trigonometric Eqns.

$\sin\theta = 0 \quad \rightarrow \theta = n\pi, \quad n \in I$

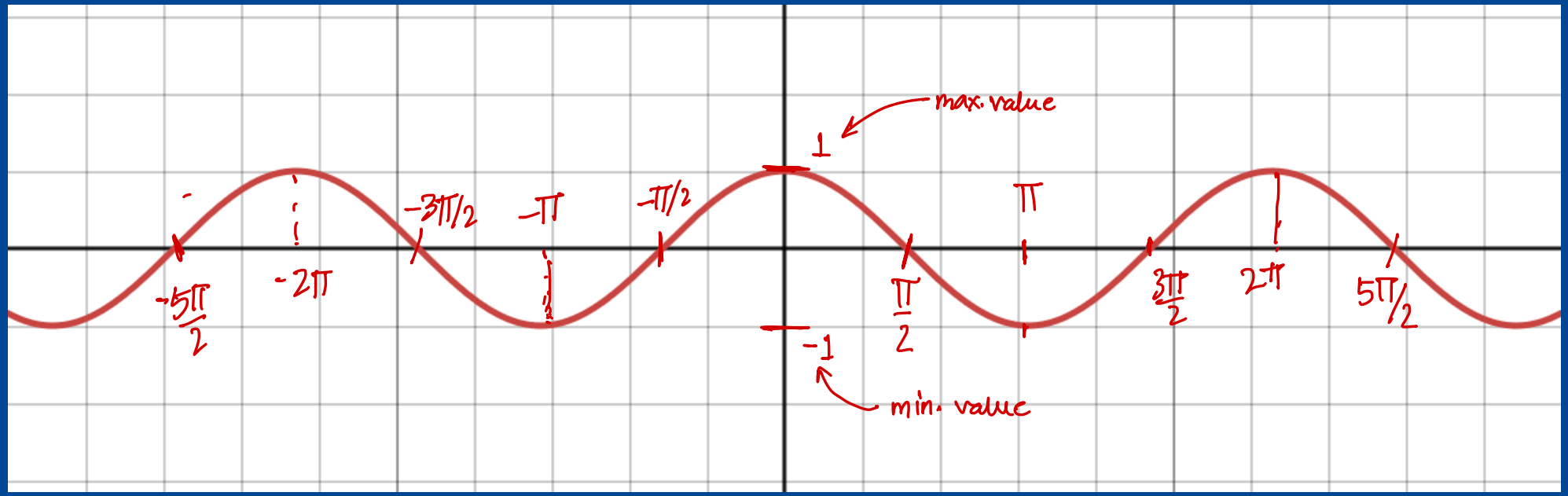
$\sin\theta = 1 \quad \rightarrow \theta = \frac{(4n+1)\pi}{2}, \quad n \in I$

$\sin\theta = -1 \quad \rightarrow \theta = \frac{(4n+3)\pi}{2}, \quad n \in I$

$\sin\theta = \sin\alpha \quad \rightarrow \theta = n\pi + (-1)^n\alpha, \quad n \in I, \quad \alpha \in \left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

$y = \cos x$ $\cos\theta = 1$, $\cos 90 = 0$

General Solutions of Trigonometric Eqns.



$\cos\theta = 0 \rightarrow \theta = \frac{(2n+1)\pi}{2}, \quad n \in I$

$\cos\theta = 1 \rightarrow \theta = 2n\pi, \quad n \in I$

$\cos\theta = -1 \rightarrow \theta = (2n+1)\pi, \quad n \in I$

$\cos\theta = \cos\alpha \rightarrow \theta = 2n\pi \pm \alpha, \quad \alpha \in [0, \pi], \quad n \in I$

General Solutions of Trigonometric Eqns.

$\cos\theta = 0 \quad \rightarrow \theta = \frac{(2n+1)\pi}{2}, \quad n \in I$

$\cos\theta = 1 \quad \rightarrow \theta = 2n\pi, \quad n \in I$

$\cos\theta = -1 \quad \rightarrow \theta = (2n+1)\pi, \quad n \in I$

$\cos\theta = \cos\alpha \quad \rightarrow \theta = 2n\pi \pm \alpha, \quad \alpha \in [0, \pi], \quad n \in I$

General Solutions of Trigonometric Eqns.

$y = \tan x$

$\tan \theta = 0$

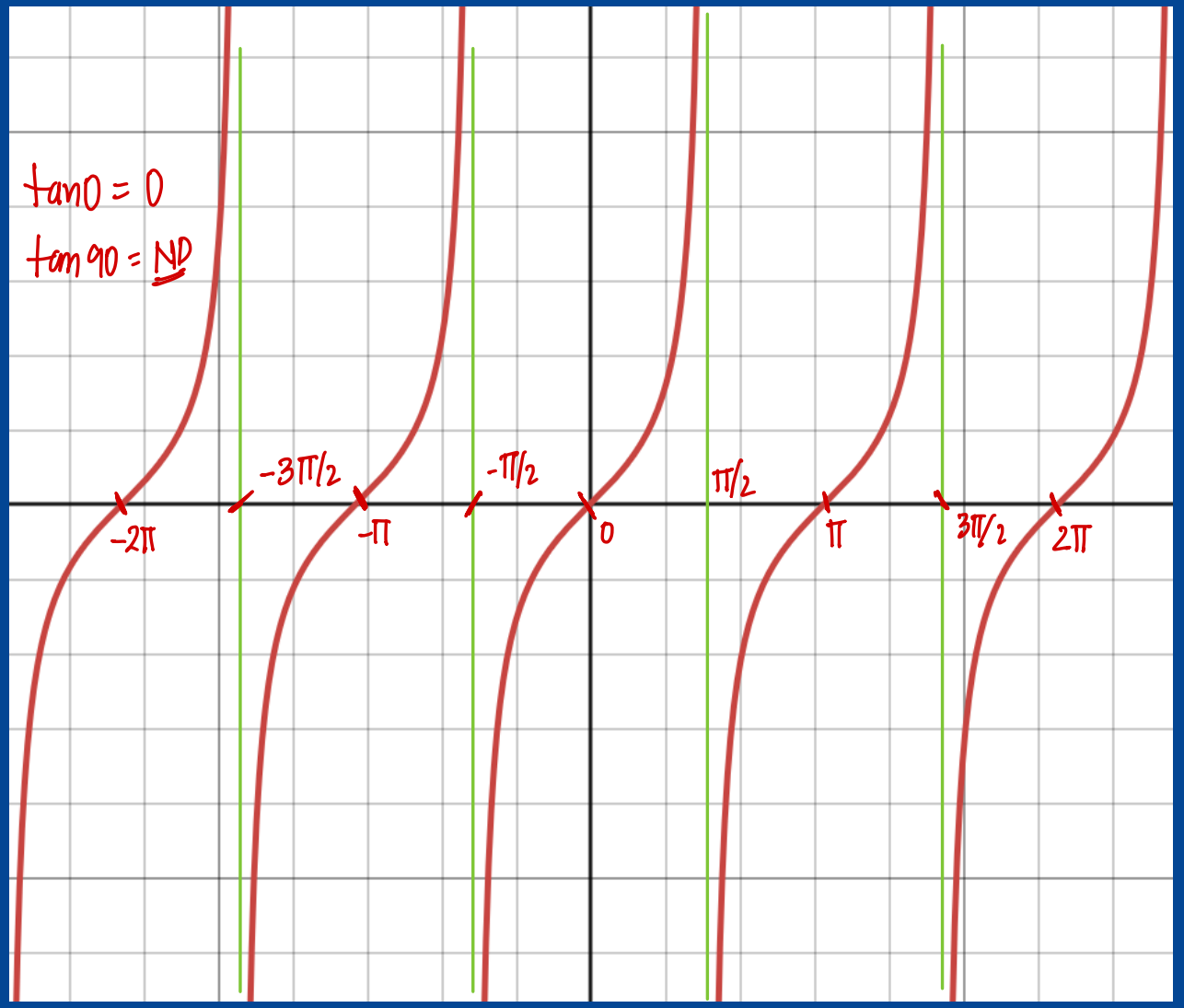
$\Rightarrow \theta = n\pi, n \in I$

$\tan \theta = \tan \alpha$

$\Rightarrow \theta = n\pi + \alpha,$

$\alpha \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right], \quad n \in I$

$\tan 90 = \frac{\sin 90}{\cos 90} = \frac{1}{0} = \text{undef.}$



General Solutions of Trigonometric Eqns.

$\tan\theta = 0 \quad \rightarrow \theta = n\pi, n \in I$

$\tan\theta = \tan\alpha \quad \rightarrow \theta = n\pi + \alpha,$

$\alpha \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right], \ n \in I$

General Solutions of Trigonometric Eqns.

$\sin\theta = \sin\alpha$ and $\cos\theta = \cos\alpha$

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

$\sin^2\theta = \sin^2\alpha$

$\cos^2\theta = \cos^2\alpha$

$\tan^2\theta = \tan^2\alpha$

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

$-1 \leq \cos x \leq 1$

The angle x lies in the third quadrant and it satisfies the equation $4(\sin^2 x + \cos x) = 1$. What is the measure of the $\angle x$?

$\sin^2 x \rightarrow 1 - \cos^2 x$

$180 < x < 270$

(a) 225° (b) 240° (c) 210° (d) 200°

$\cos 60 = \frac{1}{2}$

$\cos \frac{\pi}{3} = \frac{1}{2}$

$4(1 - \cos^2 x + \cos x) = 1$

$4 - 4\cos^2 x + 4\cos x = 1$

$4\cos^2 x - 4\cos x - 3 = 0$

-12

$-6 \quad +2$

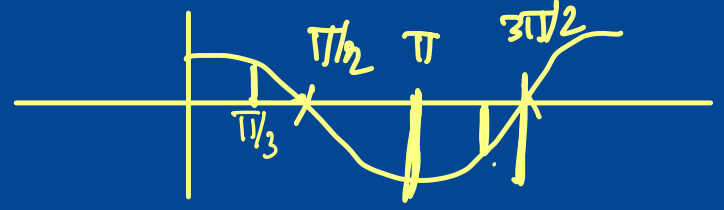
$4\cos^2 x - 6\cos x + 2\cos x - 3 = 0$

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

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

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

$\cos x = \frac{3}{2}$ ✗



The equation $\sin x \cos x = 2$ has

(a) one solution (b) two solutions

(c) infinite solutions ~~(d)~~ no solution

$-1 \leq \sin\theta \leq 1$

$\sin 2x = \sin(x+x) = \sin x \cdot \cos x + \sin x \cdot \cos x$

$\frac{\sin 2x}{2} = \sin x \cdot \cos x$

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

$\sin 2x = 4$

If n is an integer which one of the following is correct?

(a) $\tan(n\pi + \alpha) = -\tan\alpha$

~~(b)~~ $\tan(n\pi + \alpha) = \tan\alpha$

(c) $\tan(n\pi + \alpha) = \pm\tan\alpha$

(d) $\tan(n\pi + \alpha) = \pm\cot\alpha$

$\tan\theta = \tan\alpha$

$\theta = (n\pi + \alpha)$

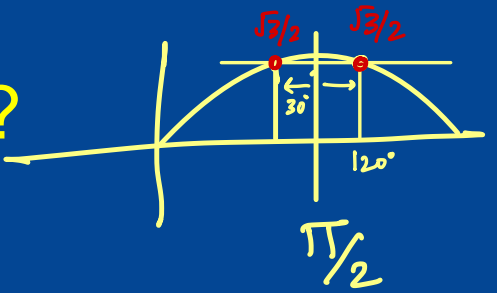
$\tan(n\pi + \alpha) = \tan\alpha$

For what value of x does the equation

$4 \sin x + 3 \sin 2x - 2 \sin 3x + \sin 4x = 2\sqrt{3}$ hold?

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

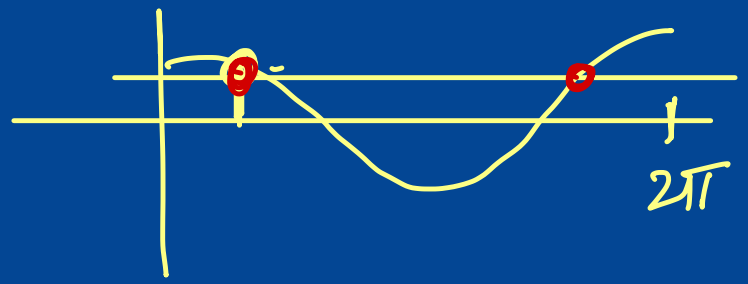
$4 \times 30^\circ = 120^\circ$



$4 \times \frac{1}{2} + 3 \times \frac{\sqrt{3}}{2} - 2 \times 1 + 1\frac{\sqrt{3}}{2} = \frac{4\sqrt{3}}{2} = \boxed{2\sqrt{3}}$

If cos 3A = ½ , then how many values can sin A assume?
(0< A < 360°)

(a) 3 (b)4 (c) 5 (d) 6

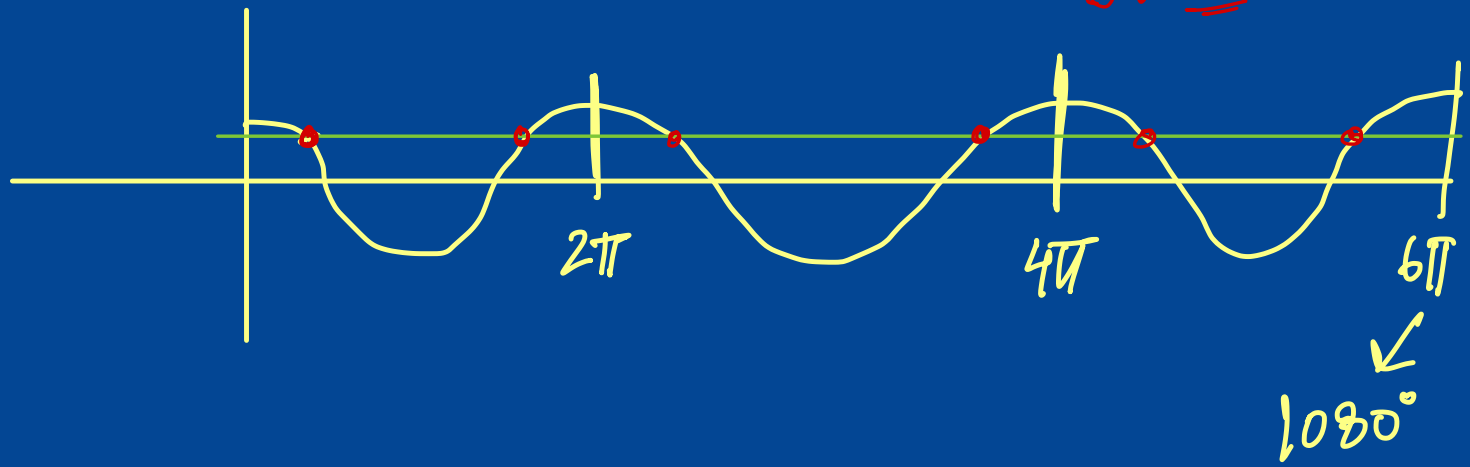


$\cos 3A = \frac{1}{2}$

$\cos 3A = \cos 60^\circ = \cos \frac{\pi}{3}$

$0 < A < 360^\circ$

$0 < 3A < 1080^\circ$



If $\sin\theta + \cos\theta = 1$, then the general value of θ is

(a) $2n\pi$

(b) $n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}$

(c) $2n\pi + \frac{\pi}{2}$

(d) None of these

$$\sin\theta + \cos\theta = 1$$

$$\frac{1}{\sqrt{2}} \cdot \sin\theta + \frac{1}{\sqrt{2}} \cdot \cos\theta = \frac{1}{\sqrt{2}}$$

$$\cos\frac{\pi}{4} \cdot \sin\theta + \sin\frac{\pi}{4} \cdot \cos\theta = \frac{1}{\sqrt{2}}$$

$$\sin\left(\theta + \frac{\pi}{4}\right) = \sin\frac{\pi}{4}$$

$\downarrow$

α

For which value of θ, $\sin\theta$ and $\cos\theta$ hold same value?

$\sin 45^\circ = \frac{1}{\sqrt{2}}$

$\cos 45 = \frac{1}{\sqrt{2}}$

$\sin\theta = \sin\alpha$

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

$\theta + \frac{\pi}{4} = n\pi + (-1)^n \frac{\pi}{4}$

$$\theta = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}$$

If $\tan^2\theta - (1+\sqrt{3})\tan\theta + \sqrt{3} = 0$, then the general value of θ is

(a) $n\pi + \frac{\pi}{4}, n\pi + \frac{\pi}{3}$ (b) $n\pi - \frac{\pi}{4}, n\pi + \frac{\pi}{3}$

(c) $n\pi + \frac{\pi}{4}, n\pi - \frac{\pi}{3}$ (d) $n\pi - \frac{\pi}{4}, n\pi - \frac{\pi}{3}$

$\tan\theta = \tan\alpha$

$\theta = n\pi + \alpha$

$\tan^2\theta - \tan\theta - \sqrt{3}\tan\theta + \sqrt{3} = 0$

$\tan\theta(\tan\theta - 1) - \sqrt{3}(\tan\theta - 1) = 0$

$(\tan\theta - 1)(\tan\theta - \sqrt{3}) = 0$

$\tan\theta = 1$ or $\tan\theta = \sqrt{3}$

$\tan\theta = \tan\frac{\pi}{4}$ or $\tan\theta = \tan\frac{\pi}{3}$

$\theta = n\pi + \frac{\pi}{4}$ $\theta = n\pi + \frac{\pi}{3}$

If $\sin^2\theta = \frac{1}{4}$, then the most general value of θ is

(a) $2n\pi \pm (-1)^n \frac{\pi}{6}$

(b) $\frac{n\pi}{2} \pm (-1)^n \frac{\pi}{6}$

(c) $n\pi \pm \frac{\pi}{6}$

(d) $2n\pi \pm \frac{\pi}{6}$

$\sin^2\theta = \sin^2\alpha$

$\theta = n\pi \pm (-1)^n \alpha$

$\sin^2\theta = \left(\frac{1}{2}\right)^2 = \sin^2\left(\frac{\pi}{6}\right)$

$\theta = n\pi \pm (-1)^n \frac{\pi}{6}$

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