Senior 1 Science Stream Math

Melvin Chia

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Chapter 1

Trigonometry

1.1 Trigonometric Equation

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

Sol. $\because 0 \le x \le 2\pi$
$\because \sin x < 0$
$\therefore x$ *is in the* 3*rd or* 4*th quadrant*
$\because$ *The reference angle of* x *is* $\frac{\pi}{4}$
$\therefore x = \frac{5\pi}{4}, \frac{7\pi}{4}$

2. $\cos x = \frac{1}{\sqrt{2}}$

Sol. $\because 0 \le x \le 2\pi$
$\because \cos x > 0$
$\therefore x$ *is in the* 1*st or* 4*th quadrant*
$\because$ *The reference angle of* x *is* $\frac{\pi}{4}$
$\therefore x = \frac{\pi}{4}, \frac{7\pi}{4}$

3. $\tan x = -\sqrt{3}$

Sol. $\because 0 \le x \le 2\pi$
$\because \tan x < 0$
$\therefore x$ *is in the* 2*nd or* 4*rd quadrant*
$\because$ *The reference angle of* x *is* $\frac{\pi}{3}$
$\therefore x = \frac{2\pi}{3}, \frac{5\pi}{3}$

4. $2\sin x = \sqrt{12}\cos x$

Sol. $\frac{\sin x}{\cos x} = \frac{\sqrt{12}}{2}$
$\tan x = \frac{2\sqrt{3}}{2}$
$\tan x = \sqrt{3}$
$\because 0 \le x \le 2\pi$
$\because \tan x > 0$
$\therefore x$ *is in the* 1*st or* 4*th quadrant*
$\because$ *The reference angle of* x *is* $\frac{\pi}{3}$
$\therefore x = \frac{\pi}{3}, \frac{4\pi}{3}$

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

Sol. $\sin\frac{2x}{3} = \frac{1}{2}$
$\because 0 \le x \le 2\pi$
$\therefore 0 \le \frac{2x}{3} \le \frac{4\pi}{3}$
$\because \sin\frac{2x}{3} > 0$
$\therefore x$ *is in the* 1*st or* 2*nd quadrant*
$\because$ *The reference angle of* $\frac{2\pi}{3}$ *is* $\frac{\pi}{6}$
$\therefore \frac{2x}{3} = \frac{\pi}{6}, \frac{5\pi}{6}$
$\therefore x = \frac{\pi}{4}, \frac{5\pi}{4}$

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

Sol. $(1 - \sin^2 x) - 2\sin x + 2 = 0$
$-\sin^2 x - 2\sin x + 3 = 0$
$\sin^2 x + 2\sin x - 3 = 0$
$(\sin x + 1)(\sin x - 3) = 0$
$\sin x = -1, 3(invalid)$
$\because 0 \le x \le 2\pi$
$\therefore x = \frac{3\pi}{2}$