INEQUALITIES

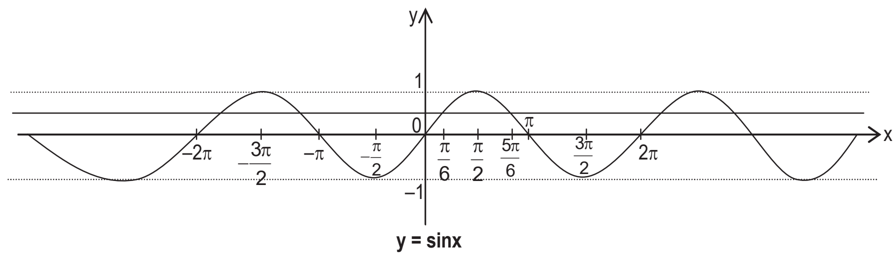
Trigonometric in equations

To solve a trigonometric inequality, transform it into many basic trigonometric inequalities. The transformation process proceeds exactly the same as in solving trigonometric equations. The common period of a trigonometric inequality is the least common multiple of all periods of the trigonometric functions presented in the inequality.

For example: The trigonometric inequality $\sin x + \sin 2x + \cos\frac{x}{2} < 1$ has 4π as common period. unless specified, the solution set of a trigonometric inequality must be solved, at least, within one whole common period.

Ex. Find the solution set of inequality $\sin x > \frac{1}{2}$.

Sol. When $\sin x = \frac{1}{2}$, the two values of x between 0 and 2π are $\frac{\pi}{6}$ and $\frac{5\pi}{6}$.



From, the graph of $y = \sin x$, it is obvious that, between 0 and, 2π, $\sin x > \frac{1}{2} \Rightarrow \frac{\pi}{6} < x < \frac{5\pi}{6}$.

Hence $\sin x > \frac{1}{2} \Rightarrow 2n\pi + \frac{\pi}{6} < x < 2n\pi + \frac{5\pi}{6}, n \in I$

The required solution set is $\bigcup_{n\in I}(2n\pi + \frac{\pi}{6}, 2n\pi + \frac{5\pi}{6})$

Practice problems

Solve the following in equations

Ex. 1. $(\sin x - 2)(2\sin x - 1) < 0$ 2. $\sin x + \sqrt{3}\cos x \geq 1$

Sol. 1. $x \in \bigcup_{n\in I}(\frac{\pi}{6} + 2n\pi, \frac{5\pi}{6} + 2n\pi)$ 2. $X \in \bigcup_{n\in I}[-\frac{\pi}{6} + 2n\pi, 2n\pi + \frac{\pi}{2}]$

Heights and distances:

Angle of elevation and depression:

Let OX be a horizontal line and P be a point which is above point O. If an observer (eye of observer) is at point O and an object is lying at point P then ∠XOP is called angle of elevation as shown in figure. If an observer (eye of observer) is at point P and object is at point O then ∠QPO is called angle of depression.