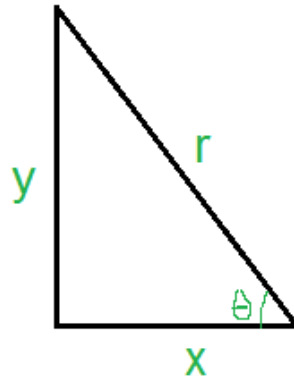


0.7 Trigonometric Functions



مقلوبها	الدالة المثلثية
$csc\theta = \frac{1}{\sin\theta} = \frac{r}{y}$	$\sin\theta = \frac{y}{r}$
$sec\theta = \frac{1}{\cos\theta} = \frac{r}{x}$	$\cos\theta = \frac{x}{r}$
$cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta} = \frac{y}{x}$	$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{y}{x}$

• **Even and Odd Trigonometric Function:**

$\sin(-x) = -\sin x \rightarrow$ **odd function**

$\cos(-x) = \cos x \rightarrow$ **even function**

Example 5 : Show that tangent is an odd function

Solution

$$\tan(-t) = \frac{\sin(-t)}{\cos(-t)} = \frac{-\sin t}{\cos t} = -\tan t$$

Example 6 : Verify that the following are identities :

(a) $1 + \tan^2 t = \sec^2 t$

(b) $1 + \cot^2 t = \csc^2 t$

Solution

$$\begin{aligned} \text{(a) } 1 + \tan^2 t &= \sec^2 t = 1 + \frac{\sin^2 t}{\cos^2 t} = \frac{\cos^2 t}{\cos^2 t} + \frac{\sin^2 t}{\cos^2 t} \\ &= \frac{\cos^2 t + \sin^2 t}{\cos^2 t} = \frac{1}{\cos^2 t} = \sec^2 t \end{aligned}$$

$$\begin{aligned} \text{(b) } 1 + \cot^2 t &= \csc^2 t = 1 + \frac{\cos^2 t}{\sin^2 t} = \frac{\sin^2 t}{\sin^2 t} + \frac{\cos^2 t}{\sin^2 t} \\ &= \frac{\sin^2 t + \cos^2 t}{\sin^2 t} = \frac{1}{\sin^2 t} = \csc^2 t \end{aligned}$$

Example 7 : Find the distance traveled by a bicycle with wheels of radius 30 cm when the wheels turn through 100 revolutions.

Solution

$$S = r\theta = r(\text{revolutions} \times 2\pi) = 30(100 \times 2\pi) = 6000\pi \text{ cm}$$