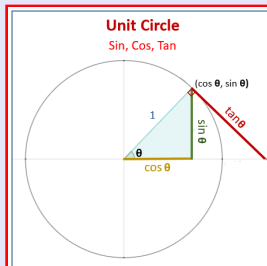


Trigonometry

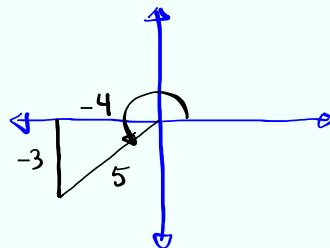
Lecture 28



Feb 19-8:47 AM

$$\sin x = -\frac{3}{5}, \quad 180^\circ < x < 270^\circ$$

$$\text{find } \cos 2x \text{ \& } \cos \frac{x}{2}$$



$$\cos 2x = \cos^2 x - \sin^2 x = \left(-\frac{4}{5}\right)^2 - \left(-\frac{3}{5}\right)^2 = \boxed{\frac{7}{25}}$$

$$\cos \frac{x}{2} = \pm \sqrt{\frac{1 + \cos x}{2}}$$

$$180^\circ < x < 270^\circ$$

$$90^\circ < \frac{x}{2} < 135^\circ$$

$$= -\sqrt{\frac{1 - \frac{4}{5}}{2}} = -\sqrt{\frac{5-4}{10}}$$

Q II
cos < 0

$$= -\sqrt{\frac{1}{10}} = -\frac{\sqrt{10}}{10}$$

Oct 16-10:30 AM

$$\sin A = \frac{1}{2} \quad A \text{ is in QII}$$

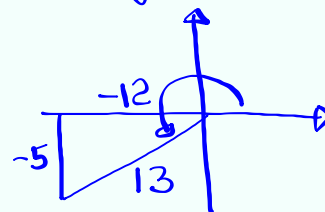
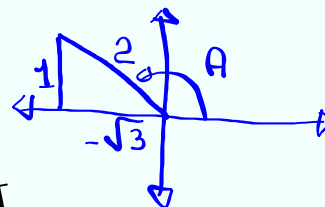
$$\tan B = \frac{5}{12} \quad B \text{ is in QIII}$$

Find

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$= -\frac{\sqrt{3}}{2} \cdot \frac{-12}{13} - \frac{1}{2} \cdot \frac{-5}{13}$$

$$= \frac{12\sqrt{3}}{26} + \frac{5}{26} = \boxed{\frac{12\sqrt{3} + 5}{26}}$$



Oct 16-10:36 AM

Evaluate $\cos 255^\circ + \cos 195^\circ$

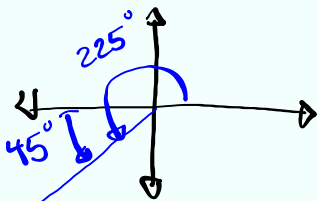
$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}$$

$$\cos 255^\circ + \cos 195^\circ = 2 \cdot \cos \frac{255^\circ + 195^\circ}{2} \cos \frac{255^\circ - 195^\circ}{2}$$

$$= 2 \cos 225^\circ \cos 30^\circ$$

$$= 2 \cdot -\cos 45^\circ \cdot \frac{\sqrt{3}}{2}$$

$$= -\cancel{2} \cdot \frac{\sqrt{2}}{\cancel{2}} \cdot \frac{\sqrt{3}}{2} = \boxed{-\frac{\sqrt{6}}{2}}$$



Oct 16-10:40 AM

Simplify

$$\frac{\sin 3x - \sin x}{\cos 3x + \cos x} = \frac{\cancel{2\cos 2x} \sin x}{\cancel{2\cos 2x} \cos x}$$

$$\sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2} = \frac{\sin x}{\cos x}$$

$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2} = \boxed{\tan x}$$

Oct 16-10:45 AM

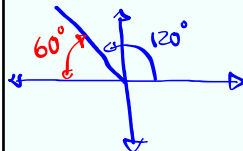
Simplify

$$\sin 110^\circ - \sin 130^\circ$$

$$\sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\sin 110^\circ - \sin 130^\circ = 2 \cos \frac{110^\circ + 130^\circ}{2} \sin \frac{110^\circ - 130^\circ}{2}$$

$$= 2 \cos 120^\circ \sin(-10^\circ)$$

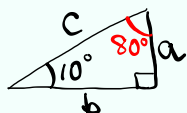


$$\sin(-\alpha) = -\sin \alpha$$

$$= 2 \cdot \checkmark \cos 60^\circ \cdot \checkmark \sin 10^\circ$$

$$= 2 \cdot \frac{1}{2} \cdot \sin 10^\circ = \boxed{\sin 10^\circ}$$

$$= \frac{a}{c} = \boxed{\cos 80^\circ}$$



Oct 16-10:49 AM

Distance = Rate • Time

You drive 50 mph for 2 hrs.

$$d = r \cdot t$$

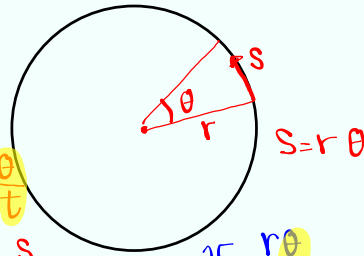
$$d = \frac{50 \text{ miles}}{\text{hr}} \cdot 2 \text{ hrs} = \boxed{100 \text{ miles}}$$

If an object moves on a Circle with radius r .

Two kinds of Speed

Angular Speed $\omega = \frac{\theta}{t}$

Linear Speed $v = \frac{s}{t}$



$$v = \frac{r \theta}{t}$$

$$v = r \omega$$

Oct 16-10:55 AM

A boy rotates a stone on a 3-ft-long string at the rate of 15 revolutions per 30 seconds.

$$1 \text{ Rev.} = 2\pi \text{ Radians}$$

Angular Speed

$$15(2\pi) = 30\pi \text{ Radians}$$

$$\omega = \frac{\theta}{t} = \frac{30\pi}{30} = \pi \text{ Rad/sec}$$

Linear Speed

$$s = r \theta$$

$$v = \frac{s}{t} = \frac{90\pi}{30} = \boxed{3\pi \text{ ft/sec.}}$$

Linear Speed

$$v = r \omega = \boxed{3 \cdot \pi \text{ ft/sec}}$$

Oct 16-11:01 AM

You are riding a bike. $r = 13$ inches

wheels are 26 inches in diameter

wheels rotates 125 Revolutions per minute

$$125 (2\pi) = 250\pi$$

Find your speed in miles/hr. Rad./min.

Linear Speed

$$v = r\omega = 13 \text{ inches} \cdot 250\pi \text{ Rad./min.}$$

$$= 3250\pi \text{ inches/min. mile/hr.}$$

$$v = \frac{3250\pi \text{ inches}}{\text{Min.}} \cdot \frac{60 \text{ Min.}}{1 \text{ hr.}} \cdot \frac{1 \text{ Mile}}{63360 \text{ inches}}$$

$$= \frac{3250\pi \cdot 60}{63360} \text{ mph} \approx \boxed{9.7 \text{ mph}}$$

Oct 16-11:09 AM

A car's wheel is 28 inches in diameter. $r = 14$ inches

How far (in miles) will the car travel if

its wheels revolve 10,000 times without

slipping?

$$10000(2\pi) = 20000\pi$$

Radians

$$\omega = \frac{\theta}{t}$$

$$v = \frac{s}{t}$$

$$v = r\omega$$

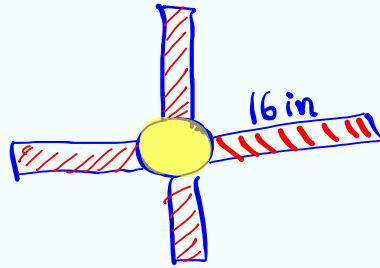
$$= 14 \text{ inches} \cdot 20000\pi$$

$$= 14 \text{ inches} \cdot 20000\pi \cdot \frac{1 \text{ Mile}}{63360 \text{ in.}}$$

$$= 13.9 \text{ miles}$$

Oct 16-11:19 AM

A fan has 16-in blades rotates 45 rpm



$$r = 16 \text{ in.}$$

$$45 \cdot 2\pi = 90\pi \frac{\text{Rad}}{\text{min}}$$

1) Find angular speed

$$\omega = \frac{\theta}{t} = 90\pi \text{ Rad/min.}$$

2) Find linear speed for the tip of the blade

$$v = r\omega = 16 \cdot 90\pi \approx 4522 \text{ in/min.}$$

Oct 16-11:27 AM