

TRIG EQUATIONS

1) Solve each equation for $0^\circ \leq x < 360^\circ$ (round to nearest tenth of degree).

a) $\sin x = -1/3$

$$\sin x = -\frac{1}{3}$$

$$\sin^{-1} \frac{1}{3} = 19.47$$

$$x = 19.47$$



$$x_1 = 180 + 19.47$$

$$x = 360 - 19.47$$

$$= 199.5^\circ$$

$$340.5^\circ$$

b) $\cot x = -\sqrt{3}/3$

$$\cot x = -\frac{\sqrt{3}}{3}$$

$$\cot x = \frac{1}{\tan x}$$

$$\frac{\text{Adjacent}}{\text{Opposite}}$$

$$\text{Adjacent} = \sqrt{3}$$

$$\text{Opposite} = 3$$



$$\tan x = \frac{\text{opp}}{\text{adj}} = \frac{-3}{\sqrt{3}}$$

$$x = 60$$

$$x_1 = 180 + 60 = 240^\circ$$

$$x_2 = 180 - 60 = 120^\circ$$

2) Solve each equation for $0 \leq x < 2\pi$ (round to the nearest hundredth of a radian).

a) $\sin x = \sqrt{2}/2$

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

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

$$x_1 = 45^\circ$$

$$x_2 = 180 - 45^\circ$$

$$= 135^\circ$$

$$\Rightarrow 135^\circ$$

b) $\cos x = -2/3$

$$\cos x = -\frac{2}{3}$$

$$x = \cos^{-1} \left(-\frac{2}{3} \right)$$

$$x = 131.8^\circ$$

3) Simplify.

a) $\frac{\sec x}{\tan x}$

$$\sec x = \frac{1}{\cos x}$$

$$\tan x = \frac{\sin x}{\cos x}$$

$$\frac{\sec x}{\tan x} = \frac{1}{\cos x} \div \frac{\sin x}{\cos x}$$

c) $(\sin x)(\sec x)$

$$\sin x \left(\frac{1}{\cos x} \right)$$

$$\frac{\sin x}{\cos x} = \tan x$$

$$\begin{aligned} &= \frac{\cos x}{\sin x \cos x} \\ &= \frac{\cos x}{\sin x} = \cot x \\ &= \frac{\cot x}{\cos x} \end{aligned}$$

b) $(\sec x - 1)(\sec x + 1)$

$$\Rightarrow \sec^2 x - 1$$

$$\Rightarrow \frac{1}{\cos^2 x} - 1$$

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

$$\Rightarrow \frac{1}{\cos^2 x} - 1 = \frac{1}{\sin^2 x}$$

$$\Rightarrow (\sec x - 1)(\sec x + 1) =$$

$$\begin{aligned} &(\sec x - 1)(\sec x + 1) \\ &\Rightarrow \frac{-1}{\sin^2 x} \end{aligned}$$

4) Prove.

a) $\tan B = \frac{\sec B}{\csc B}$

$$\tan B = \frac{\sec B}{\csc B}$$

Rem $\sec B = \frac{1}{\cos B}$

$$\csc B = \frac{1}{\sin B}$$

$$\frac{\sec B}{\csc B} = \frac{1}{\cos B} \div \frac{1}{\sin B}$$

$$\Rightarrow \frac{1}{\cos B} \times \sin B$$

$$\Rightarrow \frac{\sin B}{\cos B}$$

but $\tan B = \frac{\sin B}{\cos B}$

$$\Rightarrow \frac{\sin B}{\cos B}$$

b) $\sec x - \tan x = \frac{1 - \sin x}{\cos x}$

$$\frac{1}{\cos x} - \frac{\sin x}{\cos x}$$

solving this

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

$$\therefore \sec x - \tan x = \frac{1 - \sin x}{\cos x}$$

5) Solve $5 \sin A - \cos A = 0$, for $0 \leq A < 2\pi$ (round to the nearest hundredth of a radian).

$$5 \sin A - \cos A = 0$$

$$5 \sin A = \cos A$$

$$\frac{\sin A}{\cos A} = \frac{1}{5}$$

$$\frac{\sin A}{\cos A} = \tan A$$

$$\tan A = \frac{1}{5}$$

$$A = \tan^{-1} \frac{1}{5}$$

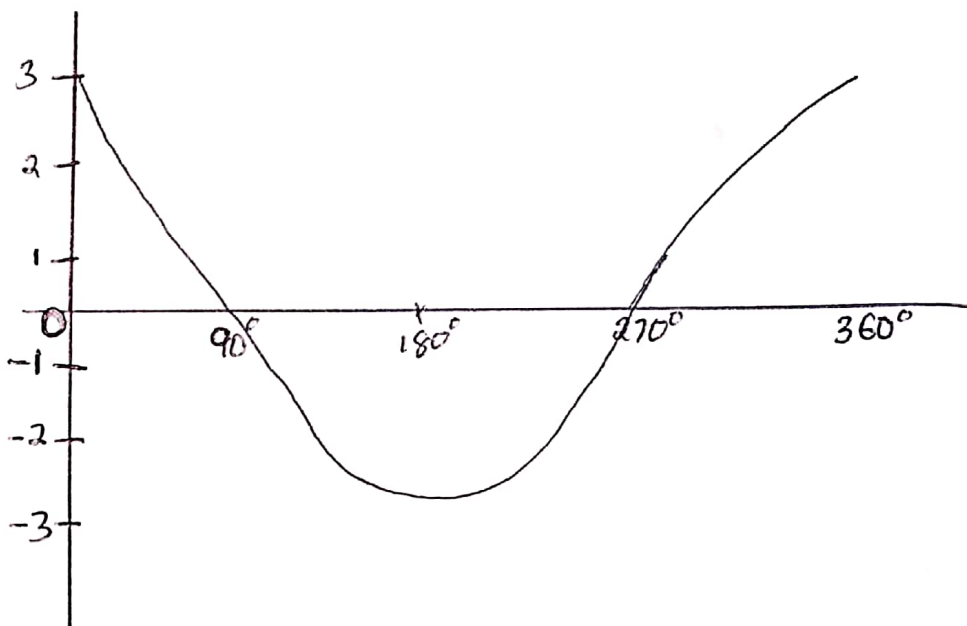
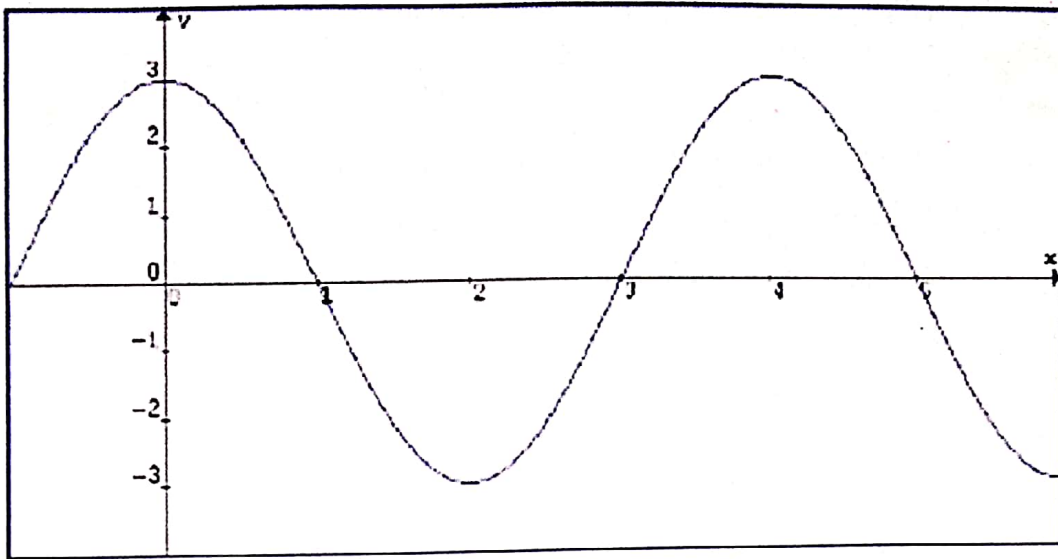
$$A = 11.3099^\circ$$

$$= 11.3099^\circ$$

$$11.3099 \times \frac{3.142}{180}$$

$$= 0.20 \text{ rad.}$$

6) Find the equation of the following graph.



$$3 \cos x$$

$$y = 3 \cos x$$

where $x = 90^\circ$