Warm up

Find a numerical value

1) If $\frac{cotx}{cosx} = 2$ find the value of sinx. → means $\boxed{\sin x =}$

Simplify left side first

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

$$\frac{\cancel{\cos x}}{\sin x} \cdot \frac{1}{\cancel{\cos x}}$$

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

$$\csc x = 2$$

$$\boxed{\sin x = \frac{1}{2}}$$

2) If $cos^2x + 2sinx - 2 = 0$ find the value of sinx. → $\boxed{\sin x =}$

$$1 - \sin^2 x + 2\sin x - 2 = 0$$

$$-\sin^2 x + 2\sin x - 1 = 0$$

$$\sin^2 x - 2\sin x + 1 = 0$$

$$(\sin x - 1)^2 = 0$$

$$\boxed{\sin x = 1}$$

3) If sinxcotx=1 find the value of cosx. → $\boxed{\cos x =}$

$$\cancel{\sin x} \cdot \frac{\cos x}{\cancel{\sin x}} = 1$$

$$\boxed{\cos x = 1}$$

4) If sinxsecx=3 find the value of cotx. → $\boxed{\cot x =}$

$$\sin x \cdot \frac{1}{\cos x} = 3$$

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

$$\tan x = 3$$

$$\boxed{\cot x = \frac{1}{3}}$$

5.4 Notes: Double Angle Formulas

Double Angle Identities

$\sin 2u = 2\sin u \cos u$

$\cos 2u = \cos^2 u - \sin^2 u$

$= 1 - 2\sin^2 u$

$= 2\cos^2 u - 1$

$\tan 2u = \dfrac{2\tan u}{1-\tan^2 u}$

NOTE: $\sin^2 u \neq \sin 2u$ $\quad \cos^2 u \neq \cos 2u$ $\quad \tan^2 u \neq \tan 2u$

Ex: 1 Solve **a.)** $2\cos x + \underline{\sin 2x} = 0$ **b.)** $3\sin^2 x + \underline{\cos 2x} - 2 = 0$

a) $2\cos x + 2\sin x\cos x = 0$

$2\cos x(1+\sin x) = 0$

$\cos x = 0$ $\quad \sin x = -1$

$\frac{\pi}{2} + 2\pi n$ $\quad \frac{3\pi}{2} + 2\pi n$

$\frac{3\pi}{2} + 2\pi n$

b) $3\sin^2 x + 1 - 2\sin^2 x - 2 = 0$

$\sin^2 x - 1 = 0$

$\sin x = \pm 1$

$\frac{\pi}{2} + 2\pi n$

$\frac{3\pi}{2} + 2\pi n$

You Try: **Solve** $\underline{\cos 2x} + \cos x = 0$

$2\cos^2 x - 1 + \cos x = 0$

$2\cos^2 x + \cos x - 1 = 0$

$(2\cos x - 1)(\cos x + 1) = 0$

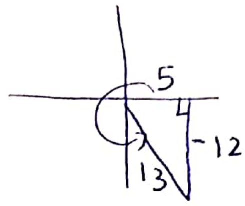
$\cos x = \frac{1}{2}$ $\quad \cos x = -1$

$\frac{\pi}{3} + 2\pi n$ $\quad \pi + 2\pi n$

$\frac{5\pi}{3} + 2\pi n$

QIV

x: 2 Given $\cos\theta = \frac{5}{13}$, and $\frac{3\pi}{2} < \theta < 2\pi$ **find** $\sin 2\theta$, $\cos 2\theta$, $\tan 2\theta$.



$\sin 2\theta = 2\sin\theta\cos\theta$

$= \frac{2}{1}\left(\frac{-12}{13}\right)\left(\frac{5}{13}\right)$

$= \boxed{\frac{-120}{169}}$

$\cos 2\theta = \cos^2\theta - \sin^2\theta$

$\left(\frac{5}{13}\right)^2 - \left(\frac{-12}{13}\right)^2$

$\frac{25}{169} - \frac{144}{169}$

$= \boxed{\frac{-119}{169}}$

$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

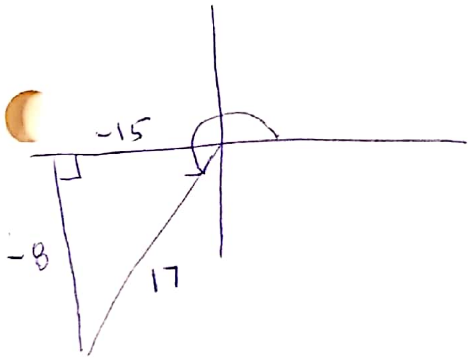
$= \frac{\frac{2}{1}\left(\frac{-12}{5}\right)}{1-\left(\frac{-12}{5}\right)^2}$

$= \frac{\frac{-24}{5}}{\frac{25}{25} - \frac{144}{25}} = \frac{\frac{-24}{5}}{\frac{-119}{25}}$

$\frac{-24}{\cancel{5}} \cdot \frac{\cancel{25}^{5}}{-119} = \boxed{\frac{120}{119}}$

QIII

You Try: **Given** $\tan u = \frac{8}{15}$, and $\pi < u < \frac{3\pi}{2}$, **find** $\sin 2\theta$, $\cos 2\theta$, $\tan 2\theta$.



$\sin 2\theta = 2\sin\theta\cos\theta$

$= \frac{2}{1}\left(\frac{-8}{17}\right)\left(\frac{-15}{17}\right)$

$= \boxed{\frac{240}{289}}$

$\cos 2\theta = \cos^2\theta - \sin^2\theta$

$= \left(\frac{-15}{17}\right)^2 - \left(\frac{-8}{17}\right)^2$

$\boxed{\frac{161}{289}}$

$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

$= \frac{2\left(\frac{8}{15}\right)}{1-\left(\frac{8}{15}\right)^2}$

$= \boxed{\frac{240}{161}}$