

# Assignment # 1

Name: \_\_\_\_\_

Block: \_\_\_\_\_

## Pre-Calculus 12 Chapter 6 In Class Assignment

1. Prove the identity

a)  $\sin^3 x + \sin x \cos^2 x = \sin x$

$$\begin{array}{l} \sin x (\sin^2 x + \cos^2 x) \\ \sin x (1) \\ \sin x \end{array} \quad \Bigg| \quad \begin{array}{l} \\ \\ \hline \sin x \end{array}$$

b)  $\frac{\sec x}{\cot x + \tan x} = \sin x$

$$\begin{array}{l} \frac{\sec x}{\frac{\cos x}{\sin x} + \frac{\sin x}{\cos x}} \\ \frac{\sec x \cdot \frac{\cos x}{\sin x} + \frac{\sin x \cdot \sec x}{\cos x \cdot \sin x}}{\frac{\sec x}{\cos^2 x + \sin^2 x}} \\ \frac{\sec x}{\frac{1}{\cos x \sin x}} \\ \frac{1}{\cos x} \cdot \frac{\cos x \cdot \sin x}{1} \\ \sin x \end{array} \quad \Bigg| \quad \begin{array}{l} \\ \\ \\ \\ \\ \\ \\ \hline \sin x \\ \\ \\ \\ \\ \\ \\ \hline \sin x \end{array}$$

c)  $\frac{\cot x}{\sec x} = \frac{1 - \sin^2 x}{\sin x}$

$$\begin{array}{l} \frac{\frac{\cos x}{\sin x}}{\frac{1}{\cos x}} \\ \frac{\cos x \cdot \cos x}{\sin x} \\ \frac{\cos^2 x}{\sin x} \end{array} \quad \Bigg| \quad \begin{array}{l} \\ \\ \hline \frac{\cos^2 x}{\sin x} \\ \\ \\ \\ \\ \\ \hline \frac{\cos^2 x}{\sin x} \end{array} \quad \pm \text{ RHS}$$

d)  $\frac{\cot x}{\csc x - 1} = \frac{\csc x + 1}{\cot x}$

$$\begin{array}{l} \frac{\cot x (\csc x + 1)}{(\csc x - 1)(\csc x + 1)} \\ \frac{\cot x (\csc x + 1)}{\csc^2 x - 1} \\ \frac{\cot x (\csc x + 1)}{\csc^2 x - 1} \\ \frac{\csc x + 1}{\cot x} \end{array} \quad \Bigg| \quad \begin{array}{l} \\ \\ \\ \\ \\ \\ \\ \hline \frac{\csc x + 1}{\cot x} \\ \\ \\ \\ \\ \\ \\ \hline \text{RHS} \end{array}$$

$$e) \frac{\sin 2x}{2-2\cos^2 x} = \cot x$$

$$\frac{\cancel{2}\sin x \cancel{\cos x}}{\cancel{2}(1-\cos^2 x)}$$

$$\frac{\cancel{\sin x} \cos x}{\cancel{\sin^2 x}}$$

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

$$\cot x \quad \quad \quad \text{RHS}$$

$$f) \frac{\sin 2x}{\cos x} + \frac{\cos 2x}{\sin x} = \csc x$$

$$\frac{\cancel{2}\sin x \cancel{\cos x}}{\cancel{\cos x}} + \frac{1-2\cancel{\sin^2 x}}{\cancel{\sin x}}$$

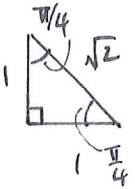
$$2\cancel{\sin x} + \frac{1}{\cancel{\sin x}} - \frac{\cancel{2}\cancel{\sin^2 x}}{\cancel{\sin x}}$$

$$\cancel{2\sin x} + \csc x - \cancel{2\sin x}$$

$$\csc x \quad \quad \quad \text{RHS}$$

2. Prove the following

$$a) \sin\left(\frac{\pi}{4} + \theta\right) - \sin\left(\frac{\pi}{4} - \theta\right) = \sqrt{2} \sin \theta$$



$$\sin \frac{\pi}{4} \cos \theta + \cos \frac{\pi}{4} \sin \theta - (\sin \frac{\pi}{4} \cos \theta - \cos \frac{\pi}{4} \sin \theta)$$

$$\frac{1}{\sqrt{2}} \cancel{\cos \theta} + \frac{1}{\sqrt{2}} \sin \theta - \frac{1}{\sqrt{2}} \cancel{\cos \theta} + \frac{1}{\sqrt{2}} \sin \theta$$

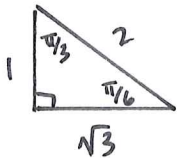
$$\frac{\sqrt{2}}{\sqrt{2}} \cdot \frac{2}{\sqrt{2}} \sin \theta = \frac{2\sqrt{2}}{2} \sin \theta = \sqrt{2} \sin \theta$$

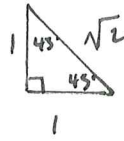
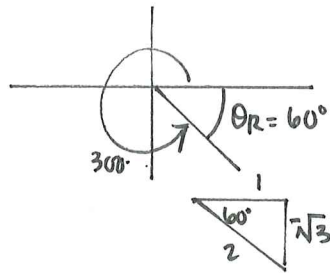
$$b) \sin\left(\frac{\pi}{6} + \theta\right) + \cos\left(\frac{\pi}{3} + \theta\right) = \cos \theta$$

$$\sin \frac{\pi}{6} \cos \theta + \cos \frac{\pi}{6} \sin \theta + (\cos \frac{\pi}{3} \cos \theta - \sin \frac{\pi}{3} \sin \theta)$$

$$\frac{1}{2} \cos \theta + \frac{\sqrt{3}}{2} \sin \theta + \frac{1}{2} \cos \theta - \frac{\sqrt{3}}{2} \sin \theta$$

$$\cos \theta$$

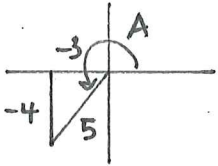




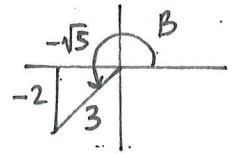
3. Determine an exact value for  $\tan 345^\circ$

$$\begin{aligned} \tan 345^\circ &= \tan(45^\circ + 300^\circ) \\ &= \frac{\tan 45^\circ + \tan 300^\circ}{1 - \tan 45^\circ \cdot \tan 300^\circ} \\ &= \frac{1 + (-\sqrt{3})}{1 - (1)(-\sqrt{3})} \\ &= \frac{(1 - \sqrt{3})(1 - \sqrt{3})}{(1 + \sqrt{3})(1 - \sqrt{3})} \end{aligned}$$

$$\begin{aligned} &= \frac{1 - \sqrt{3} - \sqrt{3} + \sqrt{9}}{1 - \sqrt{3}} \\ &= \frac{1 - 2\sqrt{3} + 3}{1 - 3} \\ &= \frac{4 - 2\sqrt{3}}{-2} \\ &= \frac{-2 + \sqrt{3}}{1} \quad \text{or } -2 + \sqrt{3} \end{aligned}$$



4. Given that  $\cos A = \frac{-3}{5}$  and  $\sin B = \frac{-2}{3}$  where A and B are both in quadrant III, use identities to evaluate:



a)  $\cos(A+B)$

b)  $\sin(A-\pi)$

$$\begin{aligned} \cos(A+B) &= \cos A \cos B - \sin A \sin B \\ &= \left(-\frac{3}{5}\right)\left(-\frac{\sqrt{5}}{3}\right) - \left(-\frac{4}{5}\right)\left(-\frac{2}{3}\right) \\ &= \frac{3\sqrt{5}}{15} - \frac{8}{15} \\ &= \frac{3\sqrt{5} - 8}{15} \end{aligned}$$

$$\begin{aligned} \sin(A-\pi) &= \sin A \cos \pi - \cos A \sin \pi \\ &= \left(-\frac{4}{5}\right)(-1) - \left(-\frac{3}{5}\right)(0) \\ &= \frac{4}{5} \end{aligned}$$

