

Pythagorean Theorem Identities:

$$\sin^2\theta + \cos^2\theta = 1$$

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

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

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

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

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Double Angle Formula:

$$\sin 2x = 2 \sin x \cos x$$

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

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

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

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

Name _____

Date _____

Advanced Algebra

Unit 10 Advanced Trigonometric Functions Assignment #26

Trig equations in Quadratic form. Solve the following.

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

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

$$\sin x = 0 \quad \sin x = -\frac{1}{2}$$

$$\boxed{0, 210, 330, 360}$$

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

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

$$\boxed{60, 180, 300}$$

5) $\sin^2 x = 4 - 4 \cos x$

$$1 - \cos^2 x = 4 - 4 \cos x$$

$$0 = \cos^2 x - 4 \cos x + 3$$

$$(\cos x - 1)(\cos x - 3) = 0$$

7) $\cos 2x - \cos x = 0$

$$\boxed{0, 360}$$

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

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

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

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

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

$$\boxed{x = 120^\circ \quad x = 0^\circ}$$

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

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

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

2) $2 \cos^2 x = \cos x$

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

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

$$\cos x = 0 \quad \cos x = \frac{1}{2}$$

$$\boxed{60, 90, 270, 300}$$

4) $2 \sin^2 x + 3 \sin x + 1 = 0$

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

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

$$\boxed{210, 330, 270}$$

6) $3 \tan x = \cot x$

$$3 \tan x = \frac{1}{\tan x}$$

$$3 \tan^2 x = 1$$

$$\tan^2 x = \frac{1}{3}$$

$$\tan x = \frac{\sqrt{3}}{3}$$

$$\boxed{30^\circ}$$

8) $\cos 2x + 3 \cos x = 1$

$$2 \cos^2 x - 1 + 3 \cos x - 1 = 0$$

$$2 \cos^2 x + 3 \cos x - 2 = 0$$

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

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

$$\boxed{x = 60^\circ}$$

10) $\sin 4x = \sin 2x$

$$\sin(2x) = 1$$

$$x = 45^\circ$$

11) $\sin x + \cos x = \sqrt{2}$

$$\sin^2 x + 2\sin x \cos x + \cos^2 x = 2$$

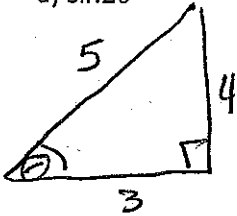
$$1 + 2\sin x \cos x = 2$$

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

Use your formulas to find the exact value of the following.

1) $\sin \theta = \frac{4}{5}$ and $\cos \theta = \frac{3}{5}$ find the exact values of

a) $\sin 2\theta$



$$\sin 2\theta =$$

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

$$2\left(\frac{4}{5}\right)\left(\frac{3}{5}\right) = \frac{24}{25}$$

b) $\cos 2\theta$

$$1 - 2\sin^2 \theta$$

$$1 - 2\left(\frac{4}{5}\right)^2$$

$$1 - \frac{32}{25}$$

$$\frac{-7}{25}$$

c) $\tan 2\theta$

$$\frac{2\tan x}{1 - \tan^2 x}$$

$$\frac{2\left(\frac{4}{3}\right)}{1 - \left(\frac{16}{9}\right)}$$

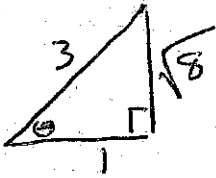
$$\frac{\frac{4}{5}}{\frac{5}{3}} = \frac{4}{3}$$

$$\tan \theta = \frac{4}{3}$$

$$\frac{\frac{8}{3}}{1 - \frac{16}{9}} = \frac{8}{3} \cdot \frac{9}{-7}$$

$$\frac{-24}{7}$$

2) If $\cos A = \frac{1}{3}$, find $\cos 2A$



$$\sin \frac{\sqrt{8}}{3}$$

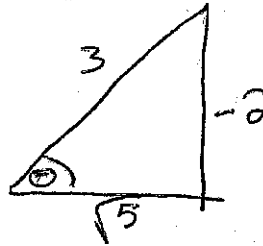
$$\cos \frac{1}{3}$$

$$\tan \frac{\sqrt{8}}{1} = \sqrt{8}$$

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

$$2\left(\frac{1}{9}\right) - 1 = \frac{2}{9} - 1 = \frac{-7}{9}$$

3) If $\sin \theta = \frac{-2}{3}$ find $\cos 2\theta$



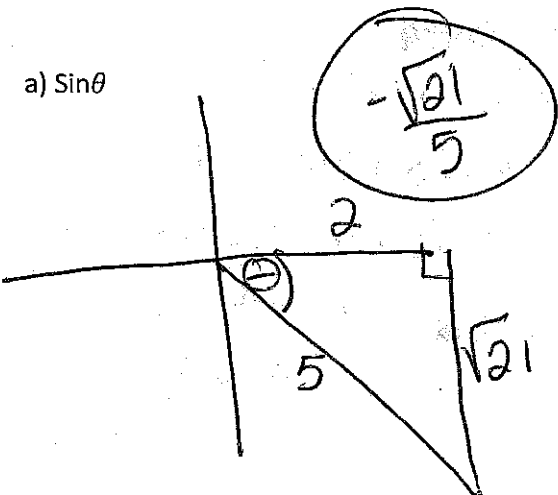
$$\cos \theta = \frac{\sqrt{5}}{3}$$

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

$$2\left(\frac{5}{9}\right) - 1 = \frac{10}{9} - 1 = \frac{1}{9}$$

3) If $\cos \theta = \frac{2}{5}$ where $270^\circ < \theta < 360^\circ$, find the exact value of

a) $\sin \theta$



$$\frac{-\sqrt{21}}{5}$$

b) $\sin 2\theta$

$$2\left(\frac{2}{5}\right)\left(\frac{-\sqrt{21}}{5}\right)$$

$$\frac{-4\sqrt{21}}{25}$$