

## Assignment : Multiple Angle Identity

Date \_\_\_\_\_

**Find the exact value of each.**

1)  $\tan \theta = -\frac{3\sqrt{5}}{5}$  where  $\frac{7\pi}{2} \leq \theta < 4\pi$

Find  $\cos \frac{\theta}{2}$

2)  $\tan \theta = -\frac{2}{5}$  where  $\frac{\pi}{2} \leq \theta < \pi$

Find  $\tan \frac{\theta}{2}$

**Verify each identity.**

3)  $2\sin^2 x + \tan^2 x = \sec^2 x - \cos 2x$

4)  $\tan^2 x(1 + \cos 2x) = 1 - \cos 2x$

5)  $\frac{\sin 2x}{\sin^2 x} = \frac{2}{\tan x}$

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

7)  $\tan^2 x + \tan^2 x \cos 2x - 1 = -\cos 2x$

8)  $1 - \tan^2 x = \cos 2x \cdot (\tan^2 x + 1)$

**Find the exact value of each.**

9)  $\sin \theta = -\frac{4}{5}$  where  $180 \leq \theta < 270$

Find  $\tan 2\theta$

10)  $\tan \theta = -\frac{4}{3}$  where  $90 \leq \theta < 180$

Find  $\cos 2\theta$

## Answers to Assignment : Multiple Angle Identity

1) 
$$\frac{\sqrt{98 + 7\sqrt{70}}}{14}$$

2) 
$$\frac{\sqrt{54 + 10\sqrt{29}}}{2}$$

3) 
$$2\sin^2 x + \tan^2 x$$

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

$$\tan^2 x + 1 - \cos 2x$$

Use  $\tan^2 x + 1 = \sec^2 x$

$$\sec^2 x - \cos 2x$$
■

4) 
$$\tan^2 x(1 + \cos 2x)$$

$$\text{Use } \tan^2 x = \frac{1 - \cos 2x}{1 + \cos 2x}$$

$$\frac{(1 + \cos 2x)(1 - \cos 2x)}{1 + \cos 2x}$$

Cancel common factors

5) 
$$\frac{1 - \cos 2x}{\frac{\sin 2x}{\sin^2 x}}$$

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

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

Cancel common factors

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

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

$$\frac{2}{\tan x}$$
■

7) 
$$\tan^2 x + \tan^2 x \cos 2x - 1$$

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

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

Decompose into sine and cosine

$$2 \cdot \left(\frac{\sin x}{\cos x}\right)^2 \cdot \cos^2 x - 1$$

Simplify

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

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

$$-\cos 2x$$
■

6) 
$$\frac{1}{1 - \tan^2 x}$$

Decompose into sine and cosine

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

Simplify

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

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

$$\frac{\cos^2 x}{\cos 2x}$$
■

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

$$8) 1 - \tan^2 x$$

Decompose into sine and cosine

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

Simplify

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

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

$$\sec^2 x (\cos^2 x - \sin^2 x)$$

Use  $\tan^2 x + 1 = \sec^2 x$

$$(\tan^2 x + 1)(\cos^2 x - \sin^2 x)$$

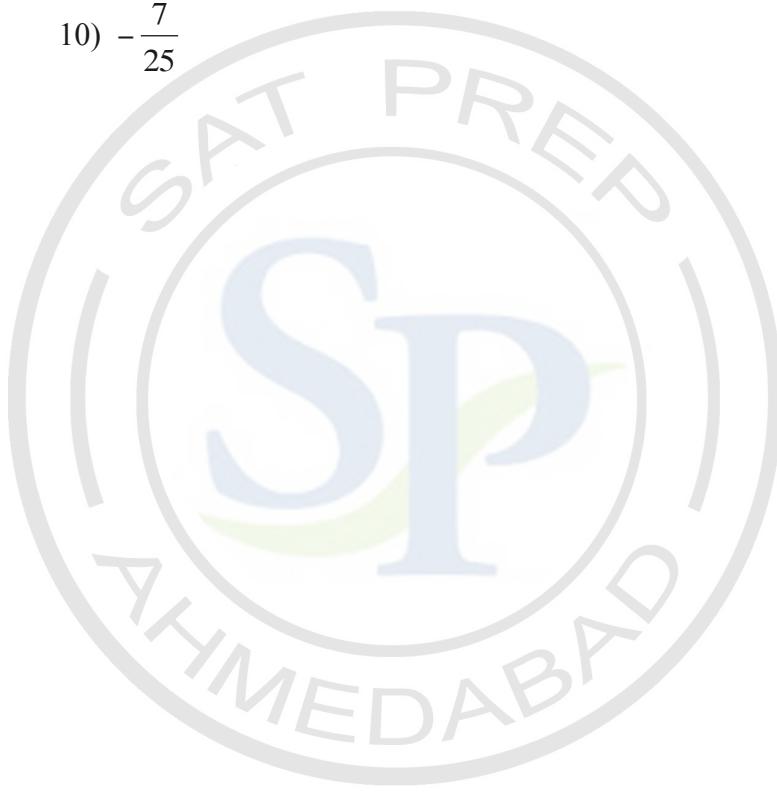
Use  $\cos 2x = \cos^2 x - \sin^2 x$

$$\cos 2x \cdot (\tan^2 x + 1)$$

■

$$9) -\frac{24}{7}$$

$$10) -\frac{7}{25}$$

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