

Name: _____

Half Angles and Power Reducing Formulas

Exercise 1: Use the half-angle formulas to determine the exact values of the sine, cosine, and tangent of the angle.

1) 75°

2) 165°

3) $112^\circ 30'$

4) $67^\circ 30'$

5) $\frac{\pi}{8}$

6) $\frac{\pi}{12}$

7) $\frac{3\pi}{8}$

8) $\frac{7\pi}{12}$

Exercise 2: Find the exact values of $\sin(u/2)$, $\cos(u/2)$, and $\tan(u/2)$ using the half-angle formulas.

1) $\sin u = \frac{5}{13}, \frac{\pi}{2} < u < \pi$

2) $\cos u = \frac{3}{5}, 0 < u < \frac{\pi}{2}$

3) $\tan u = -\frac{5}{8}, \frac{3\pi}{2} < u < 2\pi$

4) $\cot u = 3, \pi < u < \frac{3\pi}{2}$

5) $\csc u = -\frac{5}{3}, \pi < u < \frac{3\pi}{2}$

6) $\sec u = -\frac{7}{2}, \frac{\pi}{2} < u < \pi$

Exercise 3: Use the half - angle formulas to simplify the expression

1) $\sqrt{\frac{1 - \cos 6x}{2}}$

2) $\sqrt{\frac{1 + \cos 4x}{2}}$

3) $\sqrt{\frac{1 - \cos 8x}{1 + \cos 8x}}$

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

Exercise 4: Verify the identity

$$1) \quad \frac{\cos 3\beta}{\cos \beta} = 1 - 4\sin^2 \beta$$

$$2) \quad \sec \frac{u}{2} = \pm \sqrt{\frac{2 \tan u}{\tan u + \sin u}}$$

$$3) \quad \tan \frac{u}{2} = \csc u - \cot u$$

Exercise 5: Use the power reducing formulas to rewrite the expression in terms of the first power of the cosine

$$1) \quad \cos^4 x$$

$$2) \quad \sin^8 x$$

$$3) \quad \sin^2 x \cos^2 x$$

$$4) \quad \sin^2 x \cos^4 x$$

$$5) \quad \sin^4 x \cos^4 x$$

$$6) \quad \sin^4 x \cos^2 x$$