

Problem Set 16

1. Suppose that $\sin \alpha = -\frac{24}{25}$ and α is not in the fourth quadrant, and that $\cos \beta = \frac{5}{13}$ and β is not in the first quadrant. Find the exact value for each of the following.

- (a) $\cos 2\alpha$
- (b) $\sin 3\beta$
- (c) $\tan(\alpha + \beta)$

2. Find the exact value of $\tan \alpha$ if α is the angle formed by the lines $2x + 3y = -1$ and $x - 5y = -4$.
3. Find the exact value of each of the following expressions.

- (a) $\cos\left(-\frac{13\pi}{6}\right) + \sin\frac{13\pi}{4} - \cot\frac{9\pi}{2} =$
- (b) $\tan 22.5^\circ =$
- (c) $2 \sin \frac{\pi}{12} \cos \frac{\pi}{12} =$
- (d) $\sin 75^\circ =$
- (e) $\cos 285^\circ =$
- (f) $\frac{\tan 37^\circ - \tan 7^\circ}{1 + \tan 37^\circ \tan 7^\circ} =$

4. Solve each of the following equations. Present your answer in radians, exact values.

- (a) $\cos x \sin x - \sin x = 0$
- (b) $\cos^2 x - \frac{1}{4} = 0$
- (c) $(2 \cos 2x + 1)(2 \sin 3x + \sqrt{2}) = 0$
- (d) $\sqrt{3} \tan 3x + 1 = 0$

5. Prove each of the following identities.

- (a) $\sin^2 x + \tan^2 x + \cos^2 x = \sec^2 x$
- (b) $\frac{\tan x + 1}{\tan x - 1} = \frac{\sec x + \csc x}{\sec x - \csc x}$
- (c) $(y \sin \alpha + x \cos \alpha)^2 + (y \cos \alpha - x \sin \alpha)^2 = x^2 + y^2$
- (d) $\frac{1 - \tan^2 x}{1 + \tan^2 x} = \cos 2x$

6. Let α be an angle with $\cos 2\alpha = -\frac{527}{625}$, and α is in the second quadrant. Find the exact value for

- (a) $\sin \alpha$
- (b) $\tan \alpha$