

Problem Set 14

1. Find the length of the arc on a circle of radius 10 feet intercepted by a 135° central angle.
2. Find the exact value of $\tan \alpha$ if we know that $\cos \alpha = \frac{2}{5}$ and $\sin \alpha < 0$.
3. A hiker climbs for 3000 ft up a slope whose inclination is 17° . How many feet of altitude, to the nearest foot, does the hiker gain?
4. The propeller of an airplane has a radius of 3 feet. The propeller is rotating at 2250 revolutions per minute. Find the linear speed, in feet per second, of the tip of the propeller.
5. Find the exact value of each of the following expressions.

(a) $\sin 80^\circ \cos 50^\circ - \cos 80^\circ \sin 50^\circ =$

(b) $\sin 195^\circ =$

(c) $\cos^2 15^\circ - \sin^2 15^\circ =$

(d) $\tan \frac{\pi}{6} \cos \frac{\pi}{3} - \cos \frac{\pi}{2} =$

(e) $\frac{2 \tan \frac{5\pi}{12}}{1 - \tan^2 \frac{5\pi}{12}} =$

6. Prove each of the following identities.

(a) $\tan^2 x + 1 + \tan x \sec x = \frac{1 + \sin x}{\cos^2 x}$

(b) $\cos 4x = 1 - 8 \sin^2 x \cos^2 x$

(c) $\sin \left(x + \frac{\pi}{6} \right) - \cos \left(x + \frac{\pi}{3} \right) = \sqrt{3} \sin x$

7. Suppose that $\sin \alpha = \frac{3}{5}$ and α lies in quadrant I, and $\sin \beta = \frac{12}{13}$, and β lies in quadrant II. Find the exact values for

(a) $\sin (\alpha + \beta)$

(b) $\cos (\alpha - \beta)$

(c) $\tan (\alpha + \beta)$

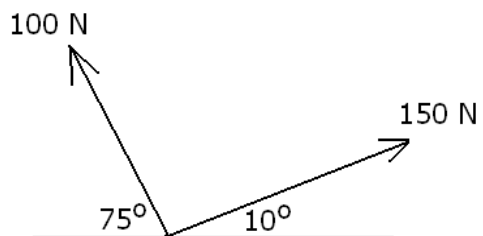
(d) $\sin 2\alpha$

8. Solve the following equations.

(a) $\cos 2x - \sin x = 1$

(b) $\sin 3x = -\frac{1}{2}$

9. Find the resultant force of the two forces shown on the picture. Present your result in



- (a) rectangular coordinates
- (b) polar coordinates.