

7. Use the unit circle to find all values of θ between 0 and 2π for which
- a) $\sin \theta = \frac{1}{2}$ b) $\cos \theta = -\frac{\sqrt{3}}{2}$ c) $\sin(-\theta) = \frac{\sqrt{2}}{2}$
d) $\cot \theta = -1$ e) $\sec \theta = -2$ f) $\csc \theta = -\sqrt{2}$
8. a) The minute hand of a clock is 3.5 cm long. How far does the tip of the minute hand travel in 25 minutes?
b) A mixing blade on a food processor extends out 3 inches from its center. If the blade is turning at 600 rpm, what is the linear velocity of the tip of the blade in feet per minute?
c) A 5-inch fixed disk in a computer rotates at 3,600 rpm. Find the linear velocity of a point 2 inches from the center of the disk. Then find the linear velocity of a point 1 inch from the center.
d) A woman rides a bicycle for 1 hour and travels 16 km (about 10 mi). Find the angular velocity of the wheel if the radius is 30 cm.
e) A propeller with radius 1.50 ft is rotating at 900 rpm. Find the linear velocity of the tip of the propeller.
9. Prove the following identities:
- a) $\sec^2 x - \tan^2 x = 1$ b) $\frac{1}{1 + \cos x} + \frac{1}{1 - \cos x} = 2 \csc^2 x$
c) $\frac{\sin x + 1}{\cos x + \cot x} = \tan x$ d) $\frac{\tan x}{\sec x} = \sin x$
e) $\tan x \sec x \cos x = 1$ f) $\frac{(2 \cos^2 x - 1)^2}{\cos^4 x - \sin^4 x} = \frac{1 + \cos x}{\sin x}$
g) Show that $\cos(\tan^{-1} v) = \frac{1}{\sqrt{1+v^2}}$ h) $\frac{1 + \cos x + \sin x}{1 + \cos x - \sin x} = \sec x + \tan x$
10. Sketch the graph of the following functions over one period.
- a) $f(x) = \frac{1}{2} \cos(5x - 3) + 1$ b) $f(x) = -\frac{1}{3} \csc(7x - \pi) + 2$
c) $f(x) = 3 \tan(7 - 2x) - 1$ d) $f(x) = -3 \sin(5x - \pi) + 1$
11. Find the exact value of the following without using a calculator.
- a) $\cos\left(\tan^{-1} \frac{3}{4}\right)$ b) $\sec\left(\cos^{-1} \frac{1}{2}\right)$ c) $\cos\left(\sin^{-1} \frac{7}{9}\right)$
d) $\cos\left(\sin^{-1}\left(-\frac{1}{3}\right) - \tan^{-1}(3)\right)$ e) $\sin\left(2 \cos^{-1}\left(-\frac{\sqrt{2}}{5}\right)\right)$ f) $\cos\left(\frac{1}{2} \tan^{-1}(-\sqrt{5})\right)$
g) $\sin\left(\tan^{-1}(-\sqrt{5}) + \cos^{-1}\left(\frac{1}{3}\right)\right)$ h) $\tan\left(\cos^{-1}\left(-\frac{1}{4}\right) - \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)\right)$
12. Solve the following equations:
- a) $-2 \sin(5x - \pi) = 1$ b) $\sin(2\theta) + \sin(4\theta) = 0$
c) $\sqrt{3} \sin \theta + \cos \theta = 1$ d) $\sin^2 \theta = 6(\cos \theta + 1)$
e) $2 \sin^2 \theta - 3 \sin \theta + 1 = 0$ f) $\sin(2\theta) = \sqrt{2} \cos \theta$
13. Solve the following application problems.
- b) A security camera in a neighborhood bank is mounted on a wall 9 ft above the floor. What angle of depression should be used if the camera is to be directed to a spot 6 ft above the floor and 12 ft from the wall?
c) From a point on ground level, you measure the angle of elevation to the top of a mountain to be 38 degree. Then you walk 200 m farther away from the mountain and find that the angle of elevation is now 20 degree. Find the height of the mountain. Round the answer to the nearest meter.