

Problem Set 18

1. Find the exact value for each of the following expressions.

(a) $\sin \frac{7\pi}{12} - \cos \frac{7\pi}{12} =$

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

(c) $\sin 50^\circ \cos(-70^\circ) + \cos 50^\circ \sin 110^\circ =$

2. Prove each of the following identities.

(a) $\sin^2 \frac{x}{2} = \frac{\csc x - \cot x}{2 \csc x}$

(b) $\cot x - \tan x = \frac{\cos 2x}{\sin x \cos x}$

(c) $\sin 6x \cos 4x = \frac{1}{2}(\sin 10x + \sin 2x)$

(d) $2 \cos^3 x - \cos x = \frac{\cos^2 x - \sin^2 x}{\sec x}$

3. Solve each of the following equations. Present exact values, in radians.

(a) $2 \cos^2 x - 9 \cos x = 5$

(b) $\tan x - 2 \cos x \tan x = 0$

(c) $\tan 4x = \sqrt{3}$

(d) $\tan^3 x = 3 \tan x$

(e) $4 \sin x - 4 \sin^3 x = 1 + \cos x (1 - 4 \sin x)$

4. Find $\cos \frac{x}{2}$ if $\cos x = \frac{1}{4}$ and x is in the first quadrant.

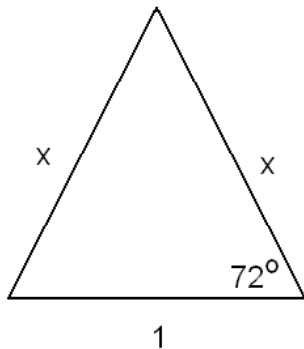
5. A force of 12 N is pulling an object upward, and another force of 10 N is pulling it to the right. Find the magnitude and the angle of the resultant force.

6. Graph the function $f(x) = 2 \sin x - 1$ on the interval $[-2\pi, 2\pi]$

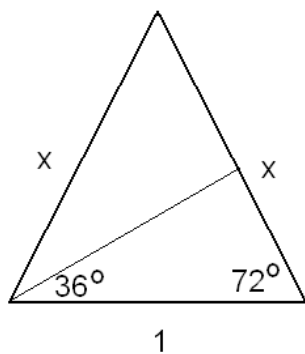
7. Graph the function $f(x) = -\frac{1}{2} \cos x + 1$ on the interval $[-2\pi, 2\pi]$

8. There is a way to find the trigonometric functions for 18° , using only algebra. Here is how it goes.

(a) Consider the picture below. Show that $\sin 18^\circ = \frac{1}{2x}$.



- (b) Based on the picture below, find the exact value of x .



- (c) Find the exact value of $\sin 18^\circ$.