

1. Evaluate the following:

**Solution:**

$$\begin{array}{cccccc}
 \cos 0^\circ = 1 & \sin \pi = 0 & \tan 45^\circ = 1 & \cos\left(\frac{\pi}{2}\right) = 0 & \sin 90^\circ = 1 & \\
 \sin \frac{5\pi}{6} = \frac{1}{2} & \cos 2\pi = 1 & \tan(-120^\circ) = \sqrt{3} & \cos\left(-\frac{3\pi}{2}\right) = 0 & \sin \frac{\pi}{3} = \frac{\sqrt{3}}{2} & \\
 \cos(-45^\circ) = \frac{1}{\sqrt{2}} & \tan \frac{\pi}{2} = \text{und} & \sin\left(-\frac{\pi}{2}\right) = -1 & \tan 8\pi = 0 & \cos 405^\circ = \frac{1}{\sqrt{2}} & \\
 \csc 0^\circ = \text{und} & \cot \pi = \text{und} & \sec 45^\circ = \sqrt{2} & \csc\left(\frac{\pi}{2}\right) = 1 & \cot 90^\circ = 0 & \\
 \sec \frac{5\pi}{6} = -\frac{2}{\sqrt{3}} & \cot 2\pi = \text{und} & \csc(-120^\circ) = -\frac{2}{\sqrt{3}} & \sec\left(-\frac{3\pi}{2}\right) = \text{und} & \csc \frac{\pi}{3} = \frac{2}{\sqrt{3}} & \\
 \cot(-45^\circ) = -1 & \sec \frac{\pi}{2} = \text{und} & \cot\left(-\frac{\pi}{2}\right) = 0 & \cot 8\pi = \text{und} & \sec 405^\circ = \sqrt{2} & 
 \end{array}$$

2. Use the reciprocal and cofunction identities to answer what follows:

$$\begin{array}{ccc}
 \sin x = 1/\csc x & \cos x = 1/\sec x & \tan x = 1/\cot x \\
 \sin(90 - x) = \cos x & \sec(90 - x) = \csc x & \tan(90 - x) = \cot x
 \end{array}$$

**Example:**  $\sec(-45) = \csc(90 - -45) = \csc 135 = 1/\sin 135 = 1/\sin 45 = \frac{1}{1/\sqrt{2}} = \sqrt{2}$

**Solution:**

$$\sin(-60) = \cos(90 - -60) = \cos(150) = -\cos(30) = -\frac{\sqrt{3}}{2}$$

$$\tan(\pi/3) = \cot(\pi/2 - \pi/3) = \cot(\pi/6) = 1/\tan(\pi/6) = \frac{1}{1/\sqrt{3}} = \sqrt{3}$$

$$\sec(-\pi/4) = \csc(\pi/2 - -\pi/4) = \csc(3\pi/4) = 1/\sin(3\pi/4) = 1/\sin(\pi/4) = \frac{1}{1/\sqrt{2}} = \sqrt{2}$$

$$\cot(2\pi/3) = \cot(\pi/2 - 2\pi/3) = \cot(5\pi/6) = 1/\tan(5\pi/6) = 1/(-\tan(\pi/6)) = \frac{1}{-1/\sqrt{3}} = -\sqrt{3}$$

$$\csc(-135) = \sec(90 - -135) = \sec(225) = -\sec(45) = -1/\cos(45) = \frac{1}{1/\sqrt{2}} = -\sqrt{2}$$

$$\cos(-5\pi/6) = \sin(\pi/2 - 5\pi/6) = \sin(8\pi/6) = \sin(4\pi/3) = -\sin(\pi/3) = -\sqrt{3}/2$$

3. Given  $0 < \theta < \pi$  and  $\sin \theta = \sqrt{3}/2$ , find each of the following:

**Solution:** The information about sine tells us that the quadrant is either I or II. That would mean two angles satisfy  $\theta$ , and hence two answers for each of the following.

This was not my intent. A typical test question will give information on the domain as seen and an unambiguous value, narrowing the it down to a single quadrant.

I should have written, "Given  $0 < \theta < \pi$  and  $\cos \theta = \sqrt{3}/2$ , find each of the following" because then you would know the quadrant is I, since cosine is negative in QII. The angle is, therefore,  $\pi/3$ .

Of course, now the first value is transparent  $\cos \theta = \sqrt{3}/2$  so  $\cos \theta = \sqrt{3}/2$ .

I'll change that one below to  $\sin \theta$ :

$$\sin \theta = 1/2 \quad \tan \theta = 1/\sqrt{3} \quad \sec \theta = 2/\sqrt{3} \quad \cot \theta = \sqrt{3} \quad \csc \theta = 2$$

4. Given  $-\pi/2 < \theta < -\pi$  and  $\sin \theta = -1/2$ , find each of the following:

**Solution:** This one is unambiguous. It's just the one quadrant, QIII, by virtue of the domain. The information you from the sine function is that the angle must be  $-2\pi/3$ . The reference angle is, therefore,  $\pi/3$ , but remember the functions are evaluated in QIII.

$$\cos \theta = -\sqrt{3}/2 \quad \tan \theta = 1/\sqrt{3} \quad \sec \theta = -2/\sqrt{3} \quad \cot \theta = \sqrt{3} \quad \csc \theta = -2$$