Review for Exam 1 Answers

Math 1060-02

September 20, 2003

1. Determine the quadrant in which the angle $\frac{5\pi}{4}$ lies.

Solution.
The angle lies in the third quadrant.

2. What is $270^\circ$ in radians.

Solution.
One degree is $\frac{\pi}{180}$ radians. Therefore $270$ degrees is $270 \times \frac{\pi}{180} = \frac{3\pi}{2}$ radians.

3. Construct a triangle so that the sides have length 2. Use this triangle to find $\sin \frac{\pi}{3}$ and $\cos \frac{\pi}{3}$.

Solution.
The value of $\sin \frac{\pi}{3}$ is $\frac{\sqrt{3}}{2}$ and the value of $\cos \frac{\pi}{3}$ is $\frac{1}{2}$.

4. Consider the triangle below. What is $\cos \theta$?
Solution.

By definition $\cos \theta = \frac{\text{adj}}{\text{hyp}}$, which is equal to $\frac{3}{5}$.

5. Verify the following trigonometric identity:

$$\sin^2 \theta - \cos^2 \theta = 2 \sin^2 \theta - 1.$$ 

Solution.

We have the following identity $\sin^2 \theta + \cos^2 \theta = 1$. Therefore

$$\sin^2 \theta - \cos^2 \theta = \sin^2 \theta - (1 - \sin^2 \theta) = 2 \sin^2 \theta - 1.$$

6. Sketch the graph of the function $y = \frac{1}{4} \sin(x - \frac{\pi}{2})$.

Solution.

In class we drew the graph of $y = \frac{1}{2} \sin(x - \frac{\pi}{2})$. The graph of $y = \frac{1}{4} \sin(x - \frac{\pi}{2})$ will look the same except the maximum and minimum values are $\frac{1}{4}$ and $-\frac{1}{4}$.

7. Find the value of $\cos(\frac{\pi}{4})$. Use this to find the value of $\arccos(\frac{1}{\sqrt{2}})$.

Solution.

The value of $\cos(\frac{\pi}{4})$ is $\frac{1}{\sqrt{2}}$. Therefore $\arccos(\frac{1}{\sqrt{2}}) = \frac{\pi}{4}$. 

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8. Find the value of \( \cos(\arcsin\left(\frac{3}{5}\right)) \).

**Solution**

The value is \( \frac{4}{5} \).

9. An airplane, flying at an altitude of 6 miles, is on a flight path that passes directly over an observer. If \( \theta \) is the angle of elevation from the observer to the plane, find the distance \( d \) from the observer to the plane when (a) \( \theta = \frac{\pi}{6} \), (b) \( \theta = \frac{\pi}{2} \).

**Solution.**

(a) We have \( \sin \frac{\pi}{6} = \frac{6}{d} \). Therefore \( d = \frac{6}{\sin \frac{\pi}{6}} = 12 \).

(b) \( d = 6 \).