Practice Exam III Halleck solutions MAT 1275 Spring 2017

Exam will last for exactly 1 hour. (The other 40 minutes will be devoted to the new material as scheduled.)

1. (10 pts) Convert 17pi/6 radians to degrees and -400 degrees to radians. Also draw each of the angles.

17pi	180 deg
6	pi

=

17~~pi~~	30 deg
1	~~pi~~

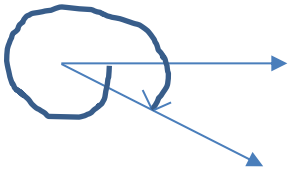
=510 deg

-400 deg	pi
	180 deg

=

-40~~0 deg~~	pi
	18~~0 deg~~

=-20/9 pi



2. (16 points) Prove the following identity:

$$\frac{\cos x}{2-2\cos x}-\frac{\cos x}{2+2\cos x}=\cot^2 x$$

$$\frac{\cos x}{2}\left[\frac{1}{1-\cos x}-\frac{1}{1+\cos x}\right]=\frac{\cos^2 x}{\sin^2 x}$$

$$\frac{\cos x}{2}\left[\frac{(1+\cos x)-(1-\cos x)}{(1-\cos x)(1+\cos x)}\right]=$$

$$\frac{\cos x}{2}\left[\frac{2\cos x}{1-\cos^2 x}\right]=$$

$$\frac{\cos^2 x}{\sin^2 x}=$$

3. (20 pts) Solve **exactly** each of the equations for [0,2pi). NO PICTURE NO CREDIT.

a) $\cot^2 x=3$

$\tan^2 x=1/3$

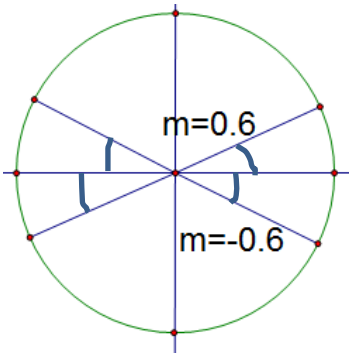
$\tan x=\pm 1/\sqrt{3}$

$x=\pi/6,5\pi/6,7\pi/6,11\pi/6$

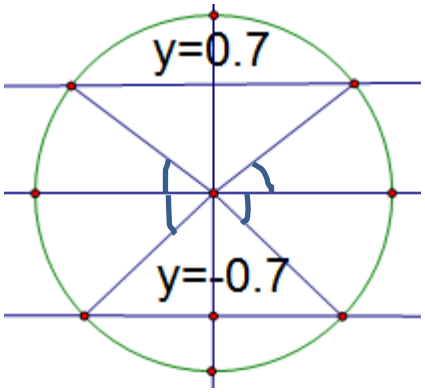
b) $2\sin^2 x-1=0$

$\sin x=\pm 1/\sqrt{2}=\pm\sqrt{2}/2$

$x=\pi/4,3\pi/4,5\pi/4,7\pi/4$



All the ref angles are pi/6



All the ref angles are pi/4

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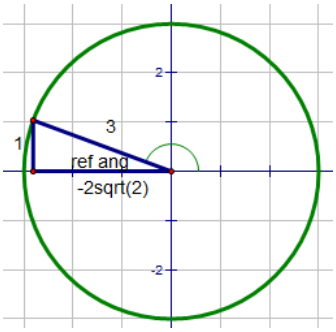
4. (20 points) Given $\csc\theta = 3$ and $\tan\theta < 0$, find the values of the 5 other trigonometric functions. NO PICTURE NO CREDIT. Use 3 as your radius for circle. Drop or raise the perpendicular to the *x*-axis to create a triangle. Draw and label the angle (Θ) as well as the reference angle (ref $\angle$).

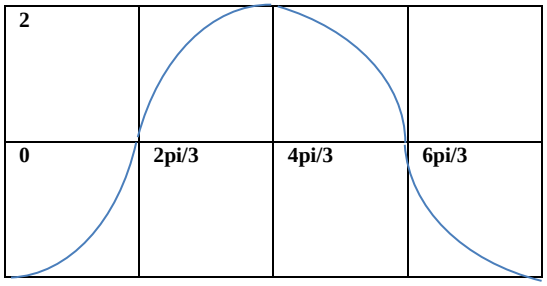
$\sin\theta = \frac{1}{3}$ $\csc\theta = 3$

$\cos\theta = -\frac{2\sqrt{2}}{3}$ $\sec\theta = -\frac{3}{2\sqrt{2}} = -\frac{3\sqrt{2}}{4}$

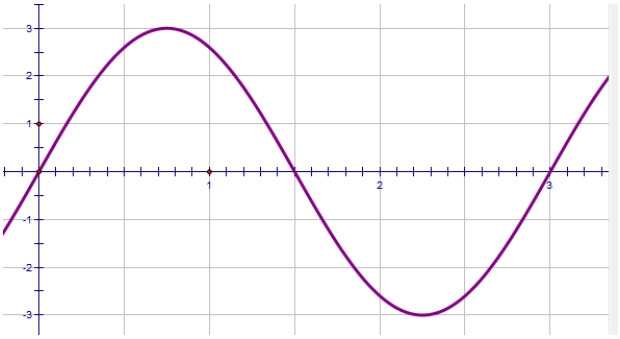
$\tan\theta = -\frac{1}{2\sqrt{2}} = -\frac{\sqrt{2}}{4}$ $\cot\theta = -2\sqrt{2}$



(14 points) a) Graph 1 period of $y = -2\cos\left(\frac{3}{4}t\right)$ on axes below. Amplitude is 2 and period is 2pi/(3/4)=8pi/3.



b) Find the equation for the graph below. Amplitude is 3 and period is 3.



$b = 2\pi/3$

$a = 3$

$y = 3\sin\left(\left(2\pi/3\right)x\right)$

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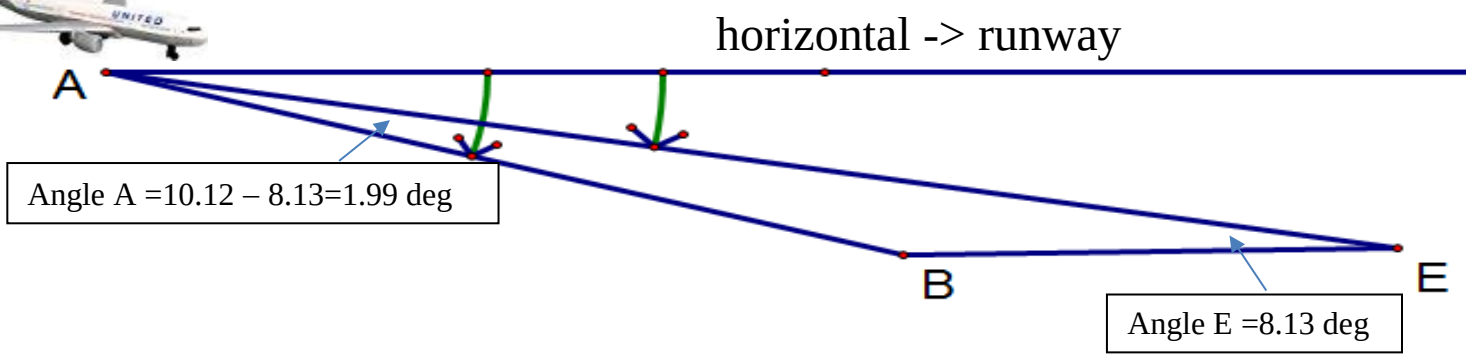
5. (20 points) When an airplane A is landing on a 2.03-mile-long runway BE, the angles of depression to the beginning B and end E of the runway are 10.12° and 8.13°, respectively.

a) Find angles A and E of the triangle ABE (Hint: the horizontal and the runway are parallel.)



b) How far is the plane from the near end of the runway (i.e., find the length of AB)? Round to the nearest **hundredth**. Write your answer as a **sentence** and include **units**.

Using the law of sines:

$$\frac{\sin A}{a} = \frac{\sin E}{e}$$

$$\frac{\sin 1.99^\circ}{2.03} = \frac{\sin 8.13^\circ}{e}$$

$$e = \frac{2.03 \sin 8.13^\circ}{\sin 1.99^\circ} = 8.27 \text{mi}$$

The plane is 8.27 miles from the beginning of the runway.