Eastern Oregon University Concurrent Enrollment/Credit by Proficiency Program

Math 112, Spring, 2015 Exam 1 name: Key

Show any relevant work. For each problem, circle your answer

1. (12 points) For each angle below, change degrees to radians and radians to degrees:

3 each

a. 210°

$210\left(\frac{\pi}{180}\right) = \frac{7\pi}{6}$ rad

b. $-3\pi/4$ rad

$\frac{-3\pi}{4} \cdot \frac{180}{\pi} = -135^\circ$

c. $13\pi/4$ rad

$\frac{13\pi}{4} \cdot \frac{180}{\pi} = 585^\circ$

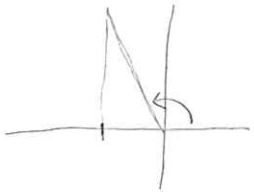
d. 480°

$480\left(\frac{\pi}{180}\right) = \frac{8\pi}{3}$ rad

2. (6 points each) Find the exact value of each of the following. Include a reference angle sketch.

a. $\cos^{-1}(-\frac{1}{2}) = \theta$ if $\cos\theta = -\frac{1}{2}$

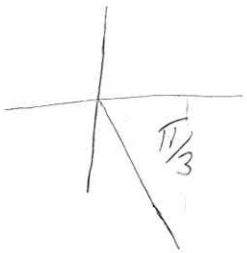
$\theta = \frac{2\pi}{3}$ +4



+2

b. $\tan(-\frac{\pi}{3}) = \frac{\sin(-\pi/3)}{\cos(-\pi/3)}$ +2

$= \frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}} = -\sqrt{3}$ +2

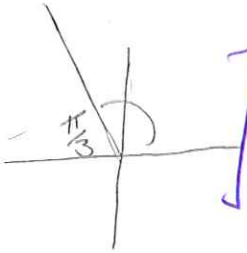


+2

c. $\csc\frac{2\pi}{3}$

$= \frac{1}{\sin\left(\frac{2\pi}{3}\right)} = \frac{1}{\frac{\sqrt{3}}{2}}$ +2

$= \frac{2}{\sqrt{3}}$ +2



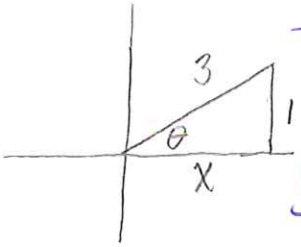
+2

d. $\cos(\sin^{-1}(\frac{1}{3}))$

$x^2 + 1 = 3^2 = 9$ +2

$x^2 = 8$

$x = \sqrt{8} \rightarrow \cos\theta = \frac{\sqrt{8}}{3}$ +2



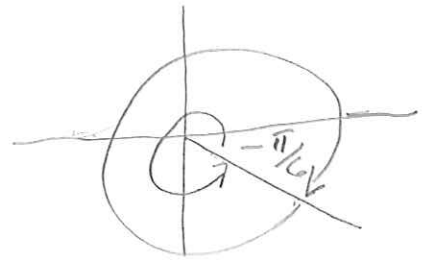
+2

3. (6 points) Find two angles, one positive and one negative, which are coterminal with $-\frac{\pi}{6}$.

$$-\frac{\pi}{6} + 2\pi = \frac{11\pi}{6} \Big] + \underline{3}$$

and

$$-\frac{\pi}{6} - 2\pi = -\frac{13\pi}{6} \Big] + \underline{3}$$



4. (10 points) A central angle θ of a circle of radius 5 is subtended by an arc of length 8. Find the measure of θ in both radians and degrees.

$$\theta = \frac{8}{5} \text{ rad} \Big] + 5$$

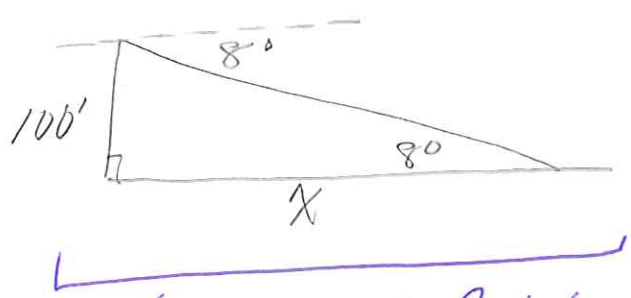
$$\frac{8}{5}\left(\frac{180}{\pi}\right) \cong 91.67^\circ \Big] + \underline{5}$$

5. (12 points) From the top of a 100 foot tall lighthouse, the angle of depression to a boat off the coast is 8°. How far is the boat from the base of the lighthouse?

$$\frac{100'}{x} = \tan 8^\circ \Big] + \underline{6}$$

$$x = \frac{100'}{\tan 8^\circ} \Big] + 3$$

$$\underbrace{\approx 711.54 \text{ feet}}_{+\,\underline{3}}$$



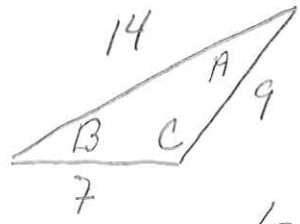
(not required but worth 4 pts if needed

6. (12 points) Solve each triangle below. Sketch appropriate triangles labeled such that side a is opposite angle A, side b opposite angle B, and side c opposite angle C.

6 a. $a = 7, \quad b = 9, \quad c = 14$

$7^2 = 9^2 + 14^2 - 2 \cdot 9 \cdot 14 \cos A$

$\frac{49 - 81 - 196}{-2 \cdot 9 \cdot 14} = \cos A$ +2



$A \approx 25.2^\circ$

$B \approx 33.2^\circ$

$C \approx 121.6^\circ$

$A = \cos^{-1}\left(\frac{-228}{-252}\right) \approx 25.2^\circ$ +1

$\frac{\sin B}{9} = \frac{\sin(25.2^\circ)}{7}$

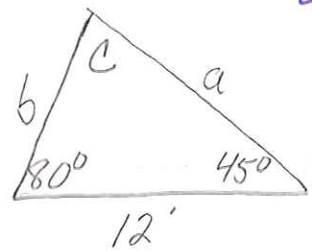
$B = \sin^{-1}\left(\frac{9}{7} \cdot \sin(25.2^\circ)\right)$ +2

$\approx 33.2^\circ$

$C = 180^\circ - (25.2 + 33.2) \approx 121.6^\circ$ +1

6 b. $A = 80°, \quad B = 45°, \quad c = 12$ feet

$C = 180^\circ - (80^\circ + 45^\circ) = 55^\circ$ +2



$\frac{\sin 80^\circ}{a} = \frac{\sin 55^\circ}{12}$

$a = \frac{12 \cdot \sin 80^\circ}{\sin 55^\circ} \approx 14.43$ ft +2

$b = \frac{12 \cdot \sin 45^\circ}{\sin 55^\circ}$

≈ 10.36 ft +2

7. (12 points) The wheel of a bicycle has a radius of 14 inches and is rotating at 200 rpm. How fast is the bicycle traveling in inches per minute? In miles per hour?

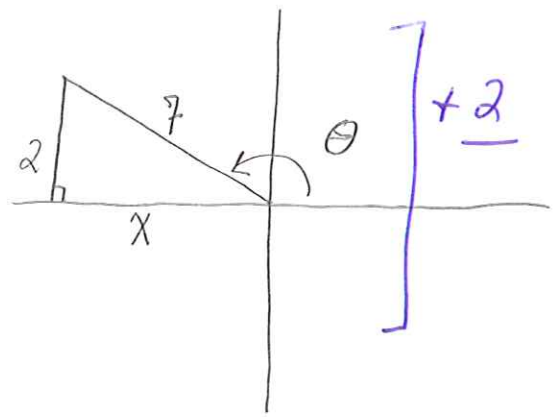
+4 $\frac{200 \text{ rev.}}{\text{min}} \cdot \frac{2\pi \cdot 14 \text{ in.}}{\text{rev.}} \approx 17{,}593$ in./min +2

$\frac{17{,}593 \text{ in}}{\text{min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times \frac{1 \text{ mi}}{5280 \text{ ft}}$ +4

≈ 16.66 mph +2

8. (12 points) If $\sin\theta = 2/7$ and $\cos\theta < 0$, find the values of the other five elementary trigonometric functions at θ. Draw a sketch with appropriate reference angle.

a. $\cos\theta = -\frac{\sqrt{45}}{7}$ + 2



+ 2

b. $\sec\theta = -\frac{7}{\sqrt{45}}$ + 1

$x^2 + 2^2 = 7^2$

$x^2 + 4 = 49$

$x^2 = 45$

$x = \sqrt{45}$, use $-\sqrt{45}$

+ 2

c. $\csc\theta = \frac{7}{2}$ + 2

d. $\tan\theta = -\frac{2}{\sqrt{45}}$ + 2

e. $\cot\theta = -\frac{\sqrt{45}}{2}$ + 1