

Name (print neatly): KEY Score: \_\_\_\_\_ /100  
(106 pts available)

**EXAM 1: Tuesday, February 11, 2014**

**Academic Honesty Pledge**

*Your signature at the bottom indicates your agreement to abide by the following rules.*

1. All purses, bags, books, notes, and other papers are placed in the back of the room.
2. **All cell phones and other electronic devices are placed in the back of the room.**
3. **Calculators are not permitted on this exam.**
4. I will not communicate with other students during the exam.
5. I will not seek help from or give help to others during the exam.
6. I will turn my exam in and will not take it from the classroom.
7. I will not discuss the exam outside of class with another student who has not yet taken the exam.
8. I will not cheat in any other way.
9. I will follow any other instructions from my professor.

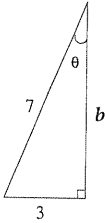
Signature: \_\_\_\_\_

## Exam 1

Show your reasoning for full credit. Use standard notation correctly. Give exact values, simplified.

1. (10 pts) Consider the right triangle pictured. Figure is not drawn to scale.

(a) Find  $b$ . Give an exact value, simplified. *By the Pythagorean theorem,*



$$b^2 + 3^2 = 7^2$$

$$b^2 = 49 - 9$$

$$b^2 = 40$$

$$b = \pm \sqrt{40}$$

but  $b > 0$  so

$$b = \sqrt{40}$$

$$= \sqrt{4 \cdot 10}$$

$$= 2\sqrt{10}$$

(b) Evaluate each of the following. Give exact values, simplified. You need not rationalize denominators.

i.  $\sin \theta = \frac{3}{7}$

iii.  $\tan \theta = \frac{3}{2\sqrt{10}}$

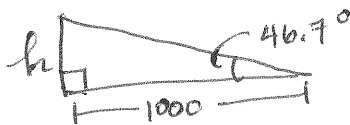
v.  $\csc \theta = \frac{7}{3}$

ii.  $\cos \theta = \frac{2\sqrt{10}}{7}$

iv.  $\sec \theta = \frac{7}{2\sqrt{10}}$

vi.  $\cot \theta = \frac{2\sqrt{10}}{3}$

2. (10 pts) A tourist is standing 1000 feet from the base of the Eiffel Tower in Paris. She sights the top of the tower and finds the angle of elevation to be  $46.7^\circ$ . Find and simplify an expression for the height  $h$  of the Eiffel Tower.



$$\frac{h}{1000} = \tan 46.7^\circ$$

$$h = 1000 \tan 46.7^\circ$$

3. (6 pts)

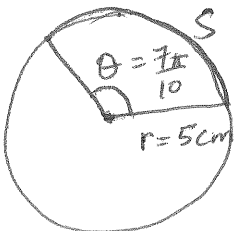
(a) Convert  $400^\circ$  to radians.

$$400^\circ = 400^\circ \cdot \frac{\pi}{180^\circ} = \frac{40\pi}{18} = \frac{20\pi}{9}$$

(b) Convert  $\frac{\pi}{36}$  radians to degrees.

$$\frac{\pi}{36} = \frac{\pi}{36} \cdot \frac{180^\circ}{\pi} = \frac{180^\circ}{36} = \frac{10^\circ}{2} = 5^\circ$$

4. (5 pts) Find the length  $s$  of an arc of a circle of radius 5 cm associated with an angle of  $\frac{7\pi}{10}$  radians.



$$s = r\theta = 5 \cdot \frac{7\pi}{10} = \frac{7\pi}{2} \text{ cm}$$

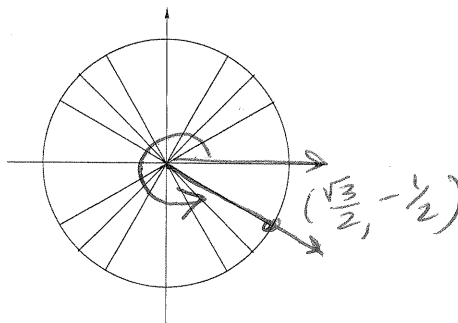
5. (15 pts) Consider  $\theta = 330^\circ$ .

3 (a) Find the reference angle for  $\theta$ .

$$30^\circ$$

3 (b) Find a negative angle coterminal with  $\theta$ .

$$-30^\circ \text{ (for example)}$$



3 (c) Sketch  $\theta$  in standard position.

(d) Evaluate each of the following. Give exact values, simplified. You need not rationalize denominators.

lea

i.  $\sin 330^\circ = -\frac{1}{2}$

iii.  $\tan 330^\circ = -\frac{1}{\sqrt{3}}$

v.  $\sec 330^\circ = \frac{2}{\sqrt{3}}$

ii.  $\cos 330^\circ = \frac{\sqrt{3}}{2}$

iv.  $\cot 330^\circ = -\sqrt{3}$

vi.  $\csc 330^\circ = -2$

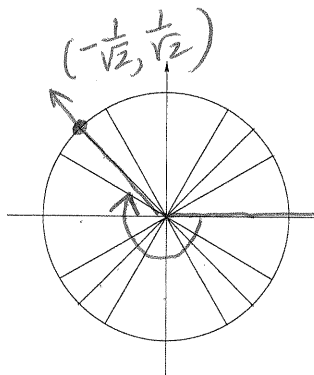
6. (15 pts) Consider  $\theta = -\frac{5\pi}{4}$ .

(a) Find the reference angle for  $\theta$ .

$$\frac{\pi}{4}$$

(b) Find a positive angle coterminal with  $\theta$ .

$$\frac{3\pi}{4} \text{ (for example)}$$



(c) Sketch  $\theta$  in standard position.

(d) Evaluate each of the following. Give exact values, simplified. You need not rationalize denominators.

i.  $\sin\left(-\frac{5\pi}{4}\right) = \frac{1}{\sqrt{2}}$

iii.  $\tan\left(-\frac{5\pi}{4}\right) = -1$

v.  $\sec\left(-\frac{5\pi}{4}\right) = -\sqrt{2}$

ii.  $\cos\left(-\frac{5\pi}{4}\right) = -\frac{1}{\sqrt{2}}$

iv.  $\cot\left(-\frac{5\pi}{4}\right) = -1$

vi.  $\csc\left(-\frac{5\pi}{4}\right) = \sqrt{2}$

7. (25 pts) Consider the function  $f(x) = \cos x$ .

(a)  $\text{dom}(\cos) = \mathbb{R}$

(b)  $\text{range}(\cos) = [-1, 1]$

(c) Is cosine an odd function, an even function, or neither?

(d) Label each of the following on the  $x$ -axis of the coordinate system below.

i.  $2\pi$

iii.  $\frac{\pi}{3}$

v.  $\frac{\pi}{6}$

vii.  $\frac{3\pi}{2}$

ix.  $\frac{3\pi}{4}$

ii.  $\frac{\pi}{2}$

iv.  $\frac{\pi}{4}$

vi.  $-\frac{\pi}{2}$

viii.  $\frac{5\pi}{3}$

x.  $\frac{7\pi}{6}$

(e) Give the exact values for each of the following.

i.  $\cos(0) = 1$

iv.  $\cos\left(\frac{\pi}{2}\right) = 0$

vii.  $\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$

ii.  $\cos(\pi) = -1$

v.  $\cos\left(-\frac{\pi}{2}\right) = 0$

viii.  $\cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}$

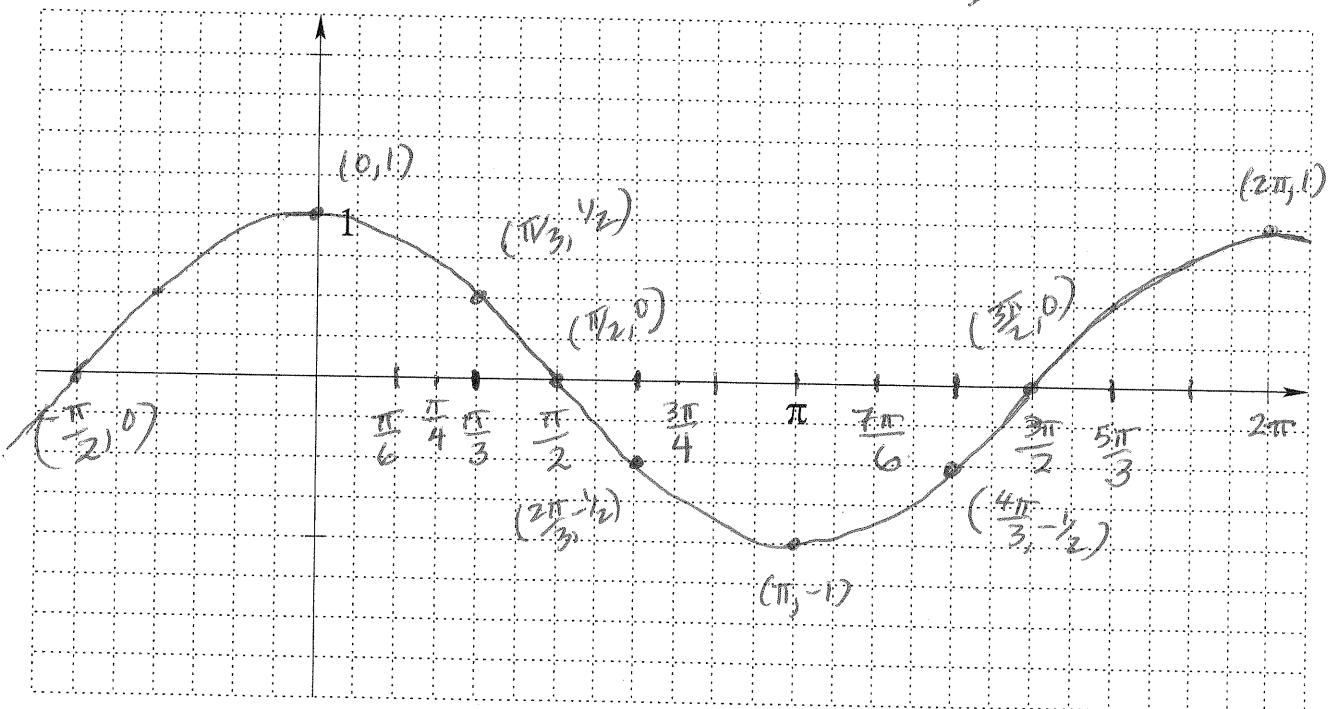
iii.  $\cos(2\pi) = 1$

vi.  $\cos\left(\frac{3\pi}{2}\right) = 0$

ix.  $\cos\left(\frac{4\pi}{3}\right) = -\frac{1}{2}$

(f) Sketch the graph  $y = \cos x$ . Fill out the whole coordinate grid.

(g) Plot and label (with their ordered pairs) the points corresponding to question 2 above.



8. (20 pts) Consider the function  $f(x) = \tan x$ .

(a)  $\text{dom}(\tan) = \dots \cup (-\frac{3\pi}{2}, -\frac{\pi}{2}) \cup (-\frac{\pi}{2}, \frac{\pi}{2}) \cup (\frac{\pi}{2}, \frac{3\pi}{2}) \cup \dots$   
 $= \{x \mid x \neq \frac{\pi}{2} + k\pi \text{ for } k \in \mathbb{Z}\}$

(b)  $\text{range}(\tan) = \mathbb{R}$

(c) Is tangent an odd function, an even function, or neither?

ODD

(d) Give the exact values for each of the following, or state "dne" (for "does not exist").

i.  $\tan(0) = 0$

iv.  $\tan(\frac{\pi}{2}) = \text{dne}$

vi.  $\tan(\frac{\pi}{4}) = 1$

ii.  $\tan(\pi) = 0$

vii.  $\tan(-\frac{\pi}{4}) = -1$

iii.  $\tan(-\pi) = 0$

v.  $\tan(\frac{-\pi}{2}) = \text{dne}$

viii.  $\tan(\frac{3\pi}{4}) = -1$

(e) Sketch the graph  $y = \tan x$ . Fill out the whole coordinate grid.

(f) Plot and label (with their ordered pairs) the points corresponding to question 2 above as well as all asymptotes (with their equations) appearing in the given grid.

