

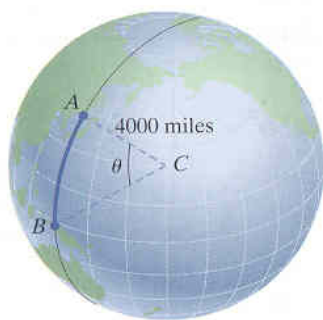
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## MATH 127 TEST 1 SAMPLE

**NOTE: The actual exam will only have 14 questions. The different parts of each question (part A, B, etc.) are variations. Know how to do all the variations on this exam.**

1A.) (4 pts) To measure two distances on the Earth, we must account for the curvature of the Earth. We measure along a circle with a center  $C$  at the center of the Earth (see below). The radius of the Earth is 4000 miles. If  $\theta = 21^\circ$ , find the distance between  $A$  and  $B$  to the nearest mile. You may write your answer in terms of  $\pi$ . Also find the area of the sector  $ABC$ .



Arc Length: \_\_\_\_\_

Area: \_\_\_\_\_

1B.) (4 pts) The minute hand of a clock is 6 inches long. How far does its tip travel in 20 minutes? (Hint: in 20 minutes the hand covers 120 degrees). What is the area of the sector swept by the minute hand? Round all answers to the nearest tenth.

Arc length: \_\_\_\_\_

Area: \_\_\_\_\_

2A.) (4 pts) A wind machine used to generate electricity has blades that are 8 feet in length. The propeller is rotating at 400 revolutions every 2 **minutes**. Find the angular speed, in radians per **second**, as well as the linear speed, in feet per **second**, of the tips of the blades. You may write your answers in terms of  $\pi$ .

angular speed: \_\_\_\_\_

linear speed: \_\_\_\_\_

2B.) (4 pts) An object is traveling around a circle with a radius of 5 meters. The object is rotating at  $\frac{1}{3}$  radians every 20 **seconds**. Find the angular speed, in radians per **minute**, as well as the linear speed, in meters per **minute**, of the object.

angular speed: \_\_\_\_\_

linear speed: \_\_\_\_\_

3A. (4 pts) Convert  $61^{\circ}42'21''$  to a decimal in degrees.  
Round to two places.

3A. \_\_\_\_\_

3B. (4 pts) Convert  $40.24^{\circ}$  to  $D^{\circ}M'S''$  form.  
Round to the nearest second.

3B. \_\_\_\_\_

4A.) (4 pts) Find the EXACT value:  $\sec^2\left(\frac{\pi}{3}\right) - \tan^2\left(\frac{\pi}{4}\right)$

4A. \_\_\_\_\_

4B.) (4 pts) Find the EXACT value:  $3 \csc \frac{\pi}{3} + \cot \frac{\pi}{4}$

4B. \_\_\_\_\_

5A.) (5 points) Find the following EXACT values if you are given  
 $\sec \theta = \frac{3}{2}$  and  $270^\circ \leq \theta \leq 360^\circ$ . Rationalize all roots.

$\sin \theta$ : \_\_\_\_\_  $\csc \theta$ : \_\_\_\_\_

$\tan \theta$ : \_\_\_\_\_  $\cot \theta$ : \_\_\_\_\_

$\cos \theta$ : \_\_\_\_\_

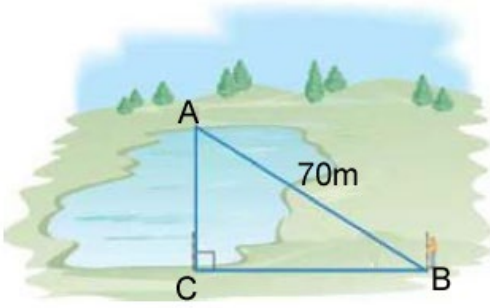
5B.) (5 points) Find the following EXACT values if you are given  
 $\tan \theta = \frac{8}{15}$  and  $\sin \theta < 0$ .

$\sin \theta$ : \_\_\_\_\_  $\csc \theta$ : \_\_\_\_\_

$\cos \theta$ : \_\_\_\_\_  $\sec \theta$ : \_\_\_\_\_

$\cot \theta$ : \_\_\_\_\_

6A.) (4 pts) In the picture below, the bearing from B to A is given as  $N55.15^\circ W$ , and the distance from B to A is 70m. Find the distance across the lake, from A to C to the nearest meter. Find the distance from C to B to the nearest meter.



A to C: \_\_\_\_\_

C to B: \_\_\_\_\_

6B.) (4 pts) A semi leaves its present location and travels along a bearing of  $S48.89^\circ E$  for 73 miles. How far south and east of its original position is it? Round to the nearest whole number.

South: \_\_\_\_\_

East: \_\_\_\_\_

7A.) (4 pts) The Burj Khalifa is currently the tallest freestanding structure. A person is standing 619 feet from the base of the building. The angle of depression from the top of the building to the person is  $77.013^\circ$ . Approximate the height of the Burj Khalifa to the nearest ft.

7A. \_\_\_\_\_

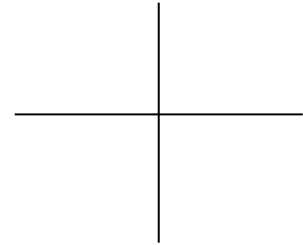
7B.) (4 pts) Suppose you are headed toward a plateau 50 meters high. If the angle of elevation to the top of the plateau is twenty degrees, how far are you from the base of the plateau? Round to two decimal places.

7B. \_\_\_\_\_

8A.) (5 pts) Find the exact value of  $\cos\left(\frac{11\pi}{6}\right)$  using reference angles. Indicate the ref. angle and draw in standard position. To get full credit, you must show the three steps as in the notes.

Value: \_\_\_\_\_

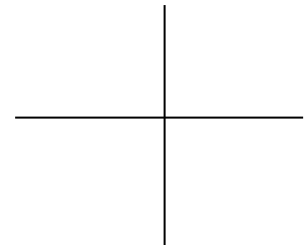
Ref. angle: \_\_\_\_\_



8B.) (5 pts) Find the exact value of  $\sin\left(\frac{5\pi}{4}\right)$  using reference angles. Indicate the ref. angle and draw in standard position. To get full credit, you must show the three steps as in the notes.

Value: \_\_\_\_\_

Ref. angle: \_\_\_\_\_



9A.) (4 pts) Find the exact value and reference angle for  $\tan(-585^\circ)$ . To get full credit, you must show the three steps as in the notes.

Value: \_\_\_\_\_

Ref. Angle: \_\_\_\_\_

9B.) (4 pts) Find the exact value and reference angle for  $\sec(-510^\circ)$ . To get full credit, you must show the three steps as in the notes.

Value: \_\_\_\_\_

Ref. Angle: \_\_\_\_\_

10A.) (6 points) Use the following equation to answer the questions:  $y = -3\sin\left(\frac{\pi}{8}x + \frac{\pi}{2}\right)$

i.) Find the period.

10i. \_\_\_\_\_

ii.) Find the amplitude.

10ii. \_\_\_\_\_

iii.) Find the phase shift.

10iii. \_\_\_\_\_

iv.) Graph the function over one period.

10B.) (6 points) Use the following equation to answer the questions:  $y = -\frac{1}{2}\cos\left(2x - \frac{\pi}{2}\right)$

i.) Find the period.

10i. \_\_\_\_\_

ii.) Find the amplitude.

10ii. \_\_\_\_\_

iii.) Find the phase shift.

10iii. \_\_\_\_\_

iv.) Graph the function over one period.

11A.) (4 pts) Find the following and graph over two full periods:  $y = -\tan\left(\frac{\pi}{4}x\right)$

Period: \_\_\_\_\_

Phase shift: \_\_\_\_\_

11B.) (4 pts) Find the following and graph over two full periods:  $y = \cot\left(3x + \frac{\pi}{4}\right)$

Period: \_\_\_\_\_

Phase shift: \_\_\_\_\_

12A.) (4 pts) Find the exact value if possible:  $\cos^{-1}(\cos(\sqrt{8}))$ .  
(Assume  $\sqrt{8}$  is in radians.)

12A. \_\_\_\_\_

12B.) (4 pts) Find the exact value if possible:  $\sin^{-1}\left(\sin\left(\frac{3\pi}{4}\right)\right)$ .

12B. \_\_\_\_\_

13A.) (4 pts) Find the exact value of  $\sec\left(\tan^{-1}\left(-\frac{3}{\sqrt{7}}\right)\right)$ .

13A. \_\_\_\_\_

13B.) (4 pts) Find the exact value of  $\cot\left(\cos^{-1}\left(-\frac{\sqrt{3}}{3}\right)\right)$ .

13B. \_\_\_\_\_

14A.) (4 pts) Use a right triangle to write  $\sin(\cos^{-1}(u))$  as an algebraic expression. Assume that  $u$  is positive and that the given inverse trigonometric function is defined for the expression in  $u$ .

14A. \_\_\_\_\_

14B.) (4 pts) Use a right triangle to write  $\tan(\sin^{-1}(4u))$  as an algebraic expression. Assume that  $u$  is positive and that the given inverse trigonometric function is defined for the expression in  $u$ .

14B. \_\_\_\_\_



## FORMULA SHEET

$$s = r\theta \quad A = \frac{1}{2}r^2\theta \quad \omega = \frac{\theta}{t} \quad v = r\omega$$

$$\cos^{-1}(\cos x) = x \quad \text{if } 0 \leq x \leq \pi$$

$$\cos(\cos^{-1} x) = x \quad \text{if } -1 \leq x \leq 1$$

$$\sin^{-1}(\sin x) = x \quad \text{if } -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$$

$$\sin(\sin^{-1} x) = x \quad \text{if } -1 \leq x \leq 1$$

$$\tan^{-1}(\tan x) = x \quad \text{if } -\frac{\pi}{2} < x < \frac{\pi}{2}$$

$$\tan(\tan^{-1} x) = x \quad \text{if } -\infty < x < \infty$$

### Complementary Angle Theorem

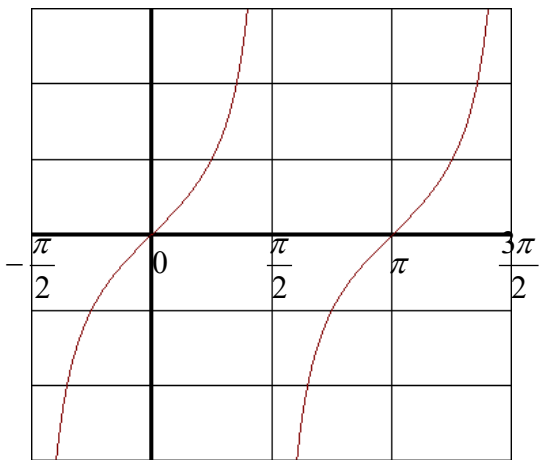
$$\sin \theta = \cos(90 - \theta) \quad \csc \theta = \sec(90 - \theta)$$

$$\cos \theta = \sin(90 - \theta) \quad \sec \theta = \csc(90 - \theta)$$

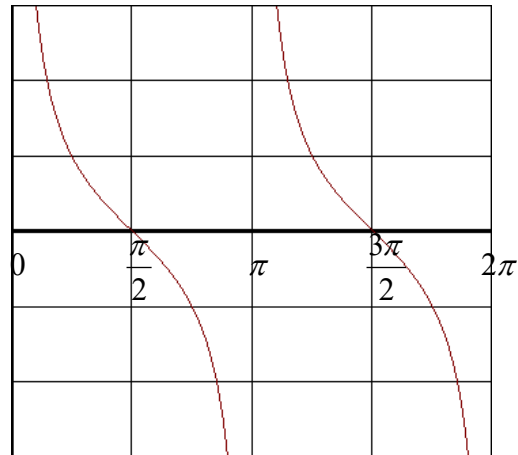
$$\tan \theta = \cot(90 - \theta) \quad \cot \theta = \tan(90 - \theta)$$

### SOHCAHTOA

Graph of  $y = \tan x$



Graph of  $y = \cot x$



### Sine/Cosine Graph formulas

$$\text{Period} = \frac{2\pi}{B} \quad \text{Amplitude} = |A|$$

$$\text{Phase Shift} = \frac{C}{B} \quad \text{Q.P.} = \frac{\text{period}}{4}$$

### Tangent/Cotangent Graph Formulas

$$\text{Period} = \frac{\pi}{B}$$

$$\text{Phase Shift (tangent)} = \frac{C}{B} - \frac{\pi}{2B}$$

$$\text{H.P.} = \frac{\text{period}}{2}$$

$$\text{Phase Shift (cotangent)} = \frac{C}{B}$$

## **MATH 127 TEST 1 REVIEW PROBS**

<b><u>Section</u></b>	<b><u>Problems</u></b>
4.1	#40 – 47, 68 – 71
4.2	#50 – 59
4.3	#57 – 60, 61 – 64
4.4	#16 – 51, 52 – 55
4.5	#6 – 18, 21
4.6	#19 – 36
4.7	#24 – 36, 37 – 41, 62

The test will be closed-book, and no notes are allowed (no notecards are allowed either). However, a formula sheet will be attached to the exam, as shown in the sample test. The exam will consist of problems similar to the ones on the sample test and the above list of review problems.