MATH 117 EXAM 3
Fall 2011

THIS EXAM IS PROVIDED AS A SAMPLE OF A PREVIOUSLY ADMINISTERED EXAM.

IF YOU ARE USING THIS EXAM AS PART OF A COURSE REVIEW, PLEASE NOTE YOUR EXAM MAY COVER DIFFERENT MATERIAL AND EMPHASIZE DIFFERENT PROBLEMS. USE THIS EXAM ONLY AS PART OF YOUR STUDY/REVIEW ROUTINE – MAKE SURE TO REVIEW YOUR CLASS ACTIVITIES (QUIZZES, TEXTBOOK ASSIGNMENTS, ETC.)!

Instructions: Make sure all electronic devices are turned off and stowed. This includes cell phones, ipods, or ipads. Only a scientific calculator is allowed. NO GRAPHING CALCULATORS!!

On the scan sheet

1. WRITE and CODE: Your name, last name first.
2. WRITE and CODE course and section number: Course no.: 117 See chart for appropriate section number.
3. Do not fill in the student ID number.
4. Put your instructor’s name at INSTRUCTOR.
5. Put the test form (located at lower right corner) at TEST FORM

After the exam begins:

1. Fill out the information at TOP of page 7.
2. Check to be sure you have 8 pages and 17 problems.

When finished submit the scan sheet and pages 7 and 8.

TEST FORM: 3-A1
Please choose the correct response and code it on the scan sheet for each of the 14 multiple-choice questions. Each multiple-choice question is worth 10 points. To receive proper credit, make sure erasures are complete on the scan sheet.

1. Suppose \( P(x, y) \) is a point on the unit circle corresponding to the distance \( t \). If point \( P \) lies in Quadrant IV and the x-coordinate of \( P \) is \( \frac{1}{3} \), determine \( \sin t \).

   \[ \begin{align*}
   a. & \quad \frac{-\sqrt{10}}{3} \\
   b. & \quad \frac{2\sqrt{2}}{3} \\
   c. & \quad \frac{-2\sqrt{2}}{3} \\
   d. & \quad \frac{2}{3} \\
   e. & \quad \text{None of the preceding}
   \end{align*} \]

2. Determine the solution to the system of equations:
\[
\begin{align*}
3x + 4y &= -12 \\
x - 2y &= -4
\end{align*}
\]
Which of the following is true?

   \[ \begin{align*}
   a. & \quad \text{The solution is a point on the x-axis.} \\
   b. & \quad \text{The solution is a point in Quadrant II.} \\
   c. & \quad \text{The solution is a point on the y-axis.} \\
   d. & \quad \text{The solution is a point in Quadrant III.} \\
   e. & \quad \text{There is no solution.}
   \end{align*} \]

3. Two points A and B are 200 feet on the same side of a river. A reference point C is on the opposite side of the river and \( \angle BAC = 78.1^\circ \) and \( \angle ABC = 58.3^\circ \). Approximate to the nearest tenth, the distance from point B to C.

   \[ \begin{align*}
   a. & \quad 141.0 \text{ feet} \\
   b. & \quad 230.0 \text{ feet} \\
   c. & \quad 283.8 \text{ feet} \\
   d. & \quad 173.9 \text{ feet} \\
   e. & \quad \text{None of the preceding}
   \end{align*} \]
4. Which of the following is equivalent to \( \sin \left( \frac{7\pi}{6} + a \right) \)? (Use an addition identity.)

(a) \( \frac{1}{2} \cos a + \frac{\sqrt{3}}{2} \sin a \)

(b) \( -\frac{1}{2} \cos a + \frac{\sqrt{3}}{2} \sin a \)

(c) \( -\frac{1}{2} \cos a - \frac{\sqrt{3}}{2} \cos a \)

(d) \( -\frac{1}{2} \cos a - \frac{\sqrt{3}}{2} \sin a \)

(e) \( -\cos a + \sin a \)

5. Which of the following is true?

I. The terminal side of an angle of 4 is in Quadrant III.

II. The smallest positive angle coterminal with \( \frac{19\pi}{4} \) is \( \frac{3\pi}{4} \).

III. If \( \sec \theta < 0 \) and \( \cot \theta < 0 \), then the terminal side of \( \theta \) must lie in Quadrant III.

(a) III

(b) I

(c) II, III

(d) I, II

(e) I, III

6. Determine the exact value of \( \cos \theta \) given \( \tan \theta = -\frac{1}{4} \) and \( \sin \theta > 0 \).

(a) \( \frac{-4\sqrt{17}}{17} \)

(b) \( -\frac{\sqrt{15}}{15} \)

(c) \( \frac{-\sqrt{17}}{17} \)

(d) \(-1\)

(e) \(-4\)
7. One complete period of a trigonometric function is graphed at the right.

Which of the following functions is the associated equation?

\[ a. \, y = 4\sin \left(2x - \frac{\pi}{2}\right) \quad b. \, y = 4\sin \left(2x + \frac{\pi}{2}\right) \]

\[ c. \, y = 4\sin \left(2x - \frac{\pi}{4}\right) \quad d. \, y = 4\sin \left(x + \frac{\pi}{4}\right) \]

\[ e. \, y = 4\sin(4x + \pi) \]

8. Rewrite \( \sin(\cos^{-1}(x)) \) as an expression in \( x \) assuming \( x > 0 \):

\[ a. \, \sqrt{1-x^2} \quad b. \, \frac{\sqrt{1-x^2}}{x} \]

\[ c. \, \frac{\sqrt{1+x^2}}{x} \quad d. \, \frac{1}{x} \]

\[ e. \, x \]

9. Which of the following statements is/are true?

I. The range of \( f(x) = \frac{1}{(x-10)^2} \) is \( (0, \infty) \)

II. The horizontal asymptote for \( g(x) = \frac{2x-5}{3x^2-7} \) is \( y = \frac{2}{3} \)

III. The x-intercept for \( g(x) = \frac{2x}{x^2-9} \) is \( (0,0) \).

\[ a. \, I \quad b. \, II \]

\[ c. \, I, III \quad d. \, II, III \]

\[ e. \, III \]
10. Solve the system: \[
\begin{align*}
&x^2 - y = 1 \\
&2x^2 + 3y = 17
\end{align*}
\]

Which of the following statements is true?

a. There is only one point of intersection.

b. There are two points of intersection.

c. There are three points of intersection.

d. There are an infinite number of points of intersection.

e. There are no points of intersection.

11. Determine the exact value of \(\sin(2\theta)\) given \(\sin \theta = \frac{-2}{5}\) and \(\tan \theta > 0\)

\[\begin{align*}
a. \quad &\frac{-4\sqrt{21}}{25} \\
b. \quad &\frac{4\sqrt{21}}{25} \\
c. \quad &\frac{-4}{5} \\
d. \quad &\frac{2\sqrt{21}}{25}
\end{align*}\]

e. None of the preceding

12. An airplane is flying at an elevation of 5200 feet directly above a straight highway. Two motorists are driving cars on the highway on opposite sides of the plane, and the angle of depression to one car is 34° and to the other is 57°. How far apart are the cars?

\[\begin{align*}
a. \quad &11,514 \text{ feet} \\
b. \quad &7,143 \text{ feet} \\
c. \quad &10,400 \text{ feet} \\
d. \quad &11,086 \text{ feet} \\
e. \quad &None \text{ of the preceding}
\end{align*}\]
13. Find the partial fraction decomposition for the expression \( \frac{-8x + 32}{x^2 - 4x - 12} \). The numerator of the fraction with denominator \( x - 6 \) is:

a. –3  
b. –2  
c. –8  
d. 32  
e. 6

14. Approximate the radius of the circle if an arc of length 4 feet on the circle subtends a central angle of 35°. Approximate your answer to the nearest hundredth.

a. 0.11 feet  
b. 2.44 feet  
c. 140.00 feet  
d. 6.55 feet  
e. 5.23 feet
For each of the following problems, write clearly and show work for those problems requiring several steps.

15. (10 pts.) Verify algebraically that the following statement is an identity: \[ \frac{\sin A}{1 - \cos A} - \cot A = \csc A. \]

Please use the correct structure for a mathematical proof.

16. (16 pts.) Short answer. Please rationalize when applicable.

a. Determine the exact value of \( \sin \left( \frac{5\pi}{3} \right) \)

b. Determine the exact value of \( \sec \left( \frac{7\pi}{6} \right) \)

c. Determine the exact value of \( \cos^{-1} \left( \frac{-\sqrt{2}}{2} \right) \)

d. What is the period of \( y = \tan x \)?
17. (14 pts.) Let \( f(x) = \frac{(x - 4)(x + 2)}{(x - 1)(x + 6)} \).

a. List all asymptotes: ________________________

b. List all x-intercepts: _______________________

c. NEATLY graph \( f(x) \) clearly indicating all asymptotes, x-intercepts, and any other analysis as was done in your class.
ANSWERS

1. C
2. A
3. C
4. D
5. D
6. A
7. B
8. A
9. C
10. B
11. B
12. D
13. B
14. D
15. PROOF:

\[
\text{LHS} = \frac{\sin A - \cos A}{1 - \cos A} = \frac{\sin A - \cos A(1 - \cos A)}{\sin A} = \frac{\sin^2 A - \cos A(1 - \cos A)}{(1 - \cos A)(\sin A)} = \frac{\sin^2 A - \cos A + \cos^2 A}{(1 - \cos A)(\sin A)} = \frac{(1 - \cos A)}{(1 - \cos A)(\sin A)} = \frac{1}{\sin A} = \csc A = \text{RHS}
\]

16. a. $\frac{-\sqrt{3}}{2}$  
b. $\frac{-2\sqrt{3}}{3}$  
c. $\frac{3\pi}{4}$  
d. $\pi$

17. a. $x = 1, x = -6, y = 1$  
b. $(4,0)$ and $(-2,0)$

c. [Diagram image]