EXAM 4: Monday, April 14, 2003

Part I: No Calculators.
*** You must hand this part in to the instructor before taking out your calculator. ***

Section A: Short Answer. (20 questions at 2 points each.)

(1) Find the terminal point on the unit circle determined by \( t = -\frac{3\pi}{2} \). ans(1) __________

(2) Find the terminal point on the unit circle determined by \( t = \frac{\pi}{3} \). ans(2) __________

(3) Find the terminal point on the unit circle determined by \( t = -\frac{5\pi}{4} \). ans(3) __________

(4) If the terminal point of \( t \) is \( \left( \frac{8}{17}, -\frac{15}{17} \right) \), find \( \csc t \). ans(4) __________

(5) If the terminal point of \( t \) is \( \left( \frac{8}{17}, -\frac{15}{17} \right) \), find \( \cot t \). ans(5) __________

(6) Find the reference number for \( t = \frac{13\pi}{10} \). ans(6) __________

(7) Find the exact value or state “undefined”: \( \cos \left( -\frac{\pi}{4} \right) \). ans(7) __________

(8) Find the exact value or state “undefined”: \( \tan \frac{11\pi}{6} \). ans(8) __________

(9) Find the exact value or state “undefined”: \( \csc(-\pi) \). ans(9) __________
(10) Find the exact value or state “undefined”: \( \sin \frac{\pi}{3} \). 

ans(10) 

(11) Is the sine function odd, even, or neither? 

ans(11) 

(12) If \( \cos t = \frac{1}{5} \), find \( \cos(-t) \). 

ans(12) 

(13) If \( \tan \theta = \frac{11}{5} \), find \( \cot(90^\circ - \theta) \). 

ans(13) 

(14) Find the period of the function \( y = -25 \cos \left(3x - \frac{\pi}{2}\right) \). 

ans(14) 

(15) Find the amplitude of the function \( y = -25 \cos \left(3x - \frac{\pi}{2}\right) \). 

ans(15) 

(16) Find the phase shift of the function \( y = -25 \cos \left(3x - \frac{\pi}{2}\right) \). 

ans(16) 

(17) Convert to radian measure: \( 18^\circ \) 

ans(17) 

(18) Find the length, \( s \), of the arc that subtends a central angle of \( \frac{7\pi}{10} \) rad in a circle of radius 3 in. 

ans(18) 

(19) Find the angle between \( 0^\circ \) and \( 360^\circ \) which is coterminal with \( \theta = 480^\circ \). 

ans(19) 

(20) Find the reference angle, in degrees, for \( \theta = 480^\circ \). 

ans(20)
Section B: Graphs.

1. (4 points) Give a formula for the function whose graph is depicted.

\[ f(x) = \] [Diagram of the first function]

2. (4 points) Give a formula for the function whose graph is depicted.

\[ f(x) = \] [Diagram of the second function]

3. (12 points) Sketch the graph of the function \( f(x) = -3 \sin \left( x + \frac{\pi}{4} \right) \). Sketch at least one full period, plotting and labeling (with the ordered pairs) the five “important” points.

[Diagram of the third function]
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Part II: Calculators Permitted.

1. (10 points) Choose one of the following two equivalent problems.

   (a) **PROVE** that the terminal point of \( t = \frac{\pi}{4} \) on the unit circle is \( \left( \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right) \).

   (b) Use right triangles to **PROVE** that \( \sin 45^\circ = \frac{1}{\sqrt{2}} \) and \( \cos 45^\circ = \frac{1}{\sqrt{2}} \).

2. (10 points) If \( \sin x = \frac{1}{5} \) and \( \tan x < 0 \), find the exact values of the remaining five trigonometric functions. *Show your work.*

\[
\sin x = \frac{1}{5} \quad \quad \quad \csc x = \, \\
\cos x = \, \quad \quad \quad \sec x = \\
\tan x = \, \quad \quad \quad \cot x = 
\]
3. (10 points) Write sec $\theta$ in terms of sin $\theta$ if $\theta$ is in quadrant III. Show your work.

4. (10 points) A 12-foot ladder leans against a building so that the angle between the ground and the ladder is $76^\circ$. How high above the ground is the top of the ladder? Draw a picture. Show your work.

5. (10 points) Simplify the trigonometric expression. Supply a reason for each step.

$$\frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta}{1 + \sin \theta}$$