Eastern Oregon University
Concurrent Enrollment/Credit by Proficiency Program

Math 112, Spring, 2015 Exam 2 name/school: Key

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

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1. (12 points) For each value of t given below, find the reference number $\bar{t}$ and the coordinates of the terminal point determined by t.

   a. $t = -\pi/6$

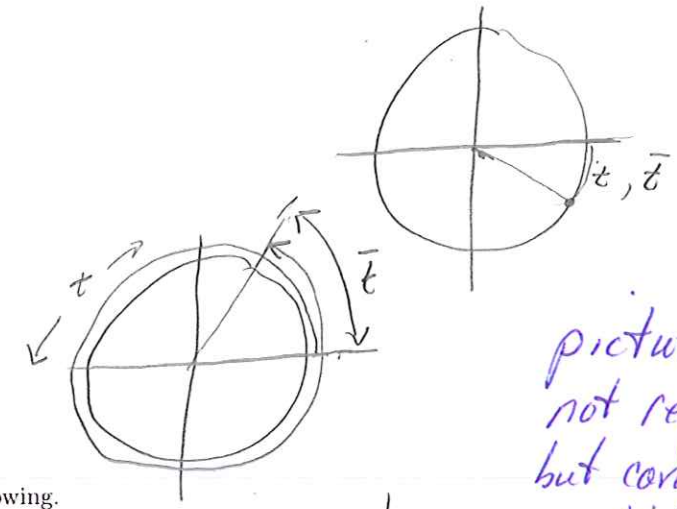
   $\bar{t} = \pi/6$] +2

   $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$] +4

   b. $t = 7\pi/3$

   $\bar{t} = \pi/3$] +2

   $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ +4



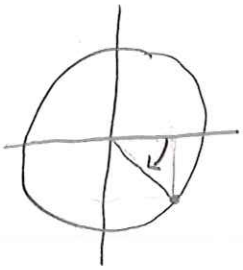
pictures not required but can earn partial credit if correct.

2. (12 points) Find the exact value of each of the following.

   6 a. $\csc(-\pi/4)$

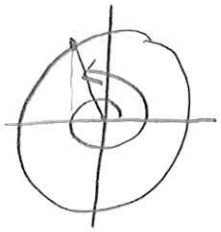
   $= \underbrace{\frac{1}{\sin(-\pi/4)}}_{+3} = \frac{1}{-\sqrt{2}/2} = -\frac{2}{\sqrt{2}}$] +3

   $= -\sqrt{2}$



   6 b. $\tan(8\pi/3)$

   $= \frac{\sin \frac{2\pi}{3}}{\cos \frac{2\pi}{3}} = \frac{\sqrt{3}/2}{-\frac{1}{2}} = \underbrace{-\sqrt{3}}_{+3}$] +3



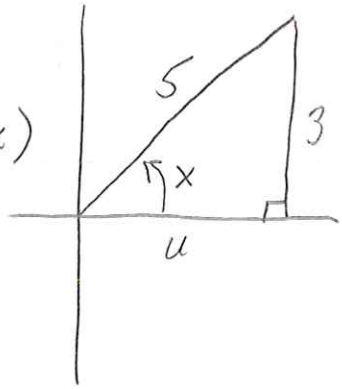
3. (8 points) Suppose $\sin x = \frac{3}{5}$ and $\cos x > 0$. Find:

   a. $\sin(-x)$

   $= \underbrace{-\sin x = -3/5}_{+4}$

   $\cos(-x) = \cos(x)$] +3

   $= 4/5$



   b. $\sin(-x) + \cos(-x)$

   $= -3/5 + 4/5 = \frac{1}{5}$] +1

$u^2 + 3^2 = 5^2$

$u^2 = 25 - 9 = 16$

$u = 4$

4. (12 points) The point $(\frac{\sqrt{5}}{3}, -\frac{2}{3})$ is the terminal point determined by a real number t. Find each of the following:

a. $\sin t$ $= -2/3$] +4

b. $\sec t$ $= 3/\sqrt{5}$] +4

c. $\cot t$ $= \frac{\sqrt{5}}{3} \Big/ -\frac{2}{3} = \frac{\sqrt{5}}{3} \cdot -\frac{3}{2} = -\frac{\sqrt{5}}{2}$] +1

+3

5. (16 points) For each of the following functions, sketch one period of the graph carefully, and label the grid sufficiently to indicate the period and either amplitude or asymptotes.

8 a. $f(x) = 2 + 2\sin(2x)$ +2

amplitude = 2

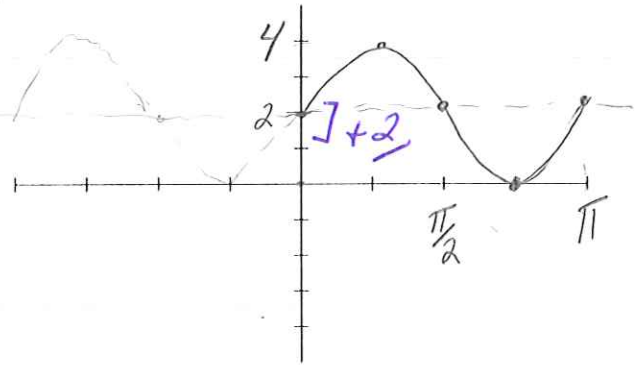
+2 period $= \frac{2\pi}{2} = \pi$

+2 vertical shift up 2 units

- need only be indicated by graph labels

$f(0) = 2 + 2\sin 0 = 2$

$f(\frac{\pi}{4}) = 2 + 2\sin \frac{\pi}{2}$
$= 2 + 2(1) = 4$,

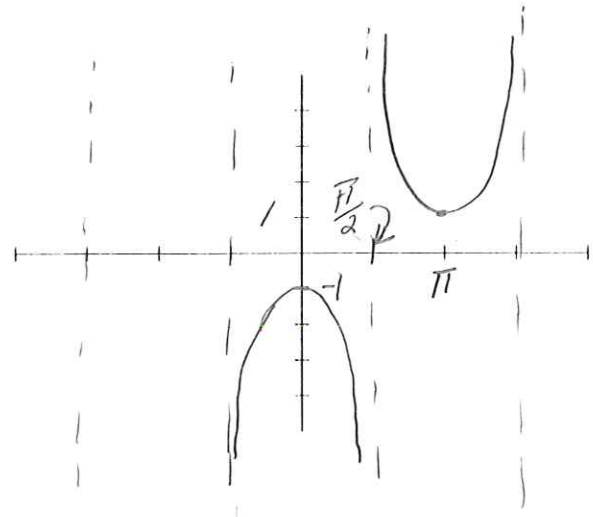


8 b. $f(x) = \csc(x - \frac{\pi}{2})$

shift csc $\frac{\pi}{2}$ units to the right

4 points for correct shape with asymptotes

4 pts for correct location with labels



6. (8 points) a. For what values of x is $\tan^{-1}(\tan x) = x$?

for $-\frac{\pi}{2} < x < \frac{\pi}{2}$] +4 $\quad$ −2 for "$\leq$"

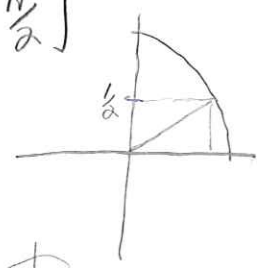
b. For what values of x is $\cos(\cos^{-1} x) = x$?

for $-1 \leq x \leq 1$] +4, −2 for "$<$"

7. (12 points) Find exact values of each of the following,

4 a. $\sin^{-1}(1/2) = y$ if $\sin y = \frac{1}{2}$, y in $[-\frac{\pi}{2}, \frac{\pi}{2}]$

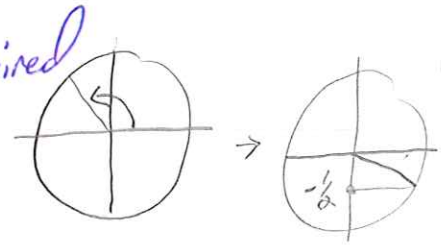
$y = \frac{\pi}{6}$] +4



4 b. $\sin^{-1}(\cos(2\pi/3))$

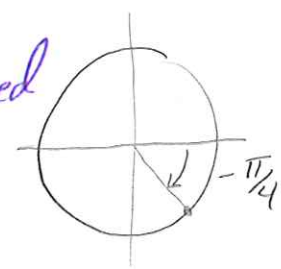
$\cos \frac{2\pi}{3} = -\frac{1}{2}$] +2, not required

$\sin^{-1}(-\frac{1}{2}) = -\frac{\pi}{6}$] +2



4 c. $\tan^{-1}\left(\tan \frac{3\pi}{4}\right) = \tan^{-1}(-1)$] +2, not required

$= -\frac{\pi}{4}$] +2



diagrams not required

8. (12 points) If $\cos t = -1/5$ and $\sin t > 0$, find the values of the trigonometric functions below.

a. $\sin t$

$= \underbrace{\frac{\sqrt{24}}{5}}_{3}$

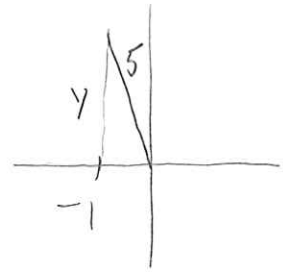
b. $\sec t$

$\underbrace{\frac{5}{\sqrt{24}}}_{3}$

c. $\tan t$

$= \frac{\sqrt{24}}{5}\left(-\frac{5}{1}\right)$] +3

$= -\sqrt{24}$



$y^2 + 1^2 = 5^2$

$y^2 = 24$

$y = \sqrt{24}$] +3

9. In a predator/prey model the predator population is modeled by the function $y = 500\cos\left(\frac{\pi}{3}t\right) + 4000$, with t measured in years.

a. (4 points) What is the maximum population?

max value is when $\cos\left(\frac{\pi}{3}t\right) = 1$, then

max is $500 + 4{,}000 = 4500$] + 4

b. (4 points) Find the length of time between successive periods of maximum population.

period $= \dfrac{2\pi}{\frac{\pi}{3}}$ years] + 3

$= 2\pi \cdot \dfrac{3}{\pi}$ years

$= 6$ years] + 1

−2 for leaving out units