

Name: \_\_\_\_\_ Exam Score: \_\_\_\_\_ /100

110 pts available

**Exam 2: Thursday, March 13, 2014**

*Show all work. Give exact values, simplified. Use proper notation. NO CALCULATORS.*

1. (15 points)

(a) *DERIVE* the Pythagorean Identity involving sine and cosine from the definitions of the trig functions. *Sketch a diagram. Give a reason for each step.*

(b) Use your answer above and other basic identities to *DERIVE* either of the other two Pythagorean Identities. *Give a reason for each step.*

2. (10 points)

(a) State the Sum formula for sine.

$$\sin(u + v) =$$

(b) Use your answer above, basic identities, and algebra to *DERIVE* the Difference formula for sine, that is, the familiar formula for  $\sin(u - v)$ . *Give a reason for each step.*

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3. (10 points) Use Sum or Difference Formulas to evaluate each of the following. *Write out each step.*

(a) Find the exact value, simplified:  $\sin \frac{7\pi}{12}$

(b) Find the exact value :  $\cos 94^\circ \cos 4^\circ + \sin 94^\circ \sin 4^\circ$

4. (10 points) Use the following Double Angle Formula for cosine to *DERIVE* another Double Angle Formula involving only the sine function. *Provide a reason for each step.*

$$\cos 2x = \cos^2 x - \sin^2 x$$

*Solution:*

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5. (10 points) *DERIVE* the Cofunction Identity for  $\sec\left(\frac{\pi}{2} - \theta\right)$  from the right triangle definitions of the trig functions. *Sketch a diagram. Explain your reasoning in full sentences.*

6. (10 points) Verify the following identity. Give a reason for each step. Do not skip steps.

$$\tan^2 \theta (1 + \cot^2 \theta) = \frac{1}{1 - \sin^2 \theta}$$

*Proof:*

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7. (15 points) Suppose  $\sec \theta = -5$  and the terminal side of  $\theta$  lies in quadrant III. Find the values of the other 5 trig functions of  $\theta$ . *Show your work clearly. Give exact answers, simplified.*

(a)  $\sin \theta =$

(c)  $\tan \theta =$

(e)  $\sec \theta = -5$

(b)  $\cos \theta =$

(d)  $\cot \theta =$

(f)  $\csc \theta =$

8. (30 points) Consider the function  $f(x) = 1 - 2 \sin\left(\frac{2}{3}x - \frac{\pi}{6}\right) = 1 - 2 \sin\left[\frac{2}{3}\left(x - \frac{\pi}{4}\right)\right]$ .

(a) Find each of the following.

i. (3 pts) amplitude: \_\_\_\_\_

ii. (3 pts) period: \_\_\_\_\_

iii. (3 pts) phase shift (horizontal translation): \_\_\_\_\_

iv. (3 pts) vertical translation: \_\_\_\_\_

(b) (12 pts) Sketch the graph  $y = f(x)$ . Fill out the whole coordinate grid.

(c) (6 pts) Plot and label (with their ordered pairs) the 5 important points in one period.

