Math 150 Plane Trigonometry
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Midterm Exam 2
July 9, 2013

Your name: ______________________________
Instructor: ______________________________

Instructions:
Show all your work in the space provided under each question. Please write neatly and present your answers in an organized way. You may use your one sheet of notes but calculators will not be permitted. This exam is worth 100 points.

The chart below indicates how many points each problem is worth.

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1. Verify the identities.

(a) $\cot t = \frac{\csc t - \sin t}{\cos t}$

(b) $\sin \left( \frac{\pi}{2} - \theta \right) = \frac{\sin (2\theta)}{2 \sin \theta}$
1. (continued)
   (c) \(\cot^2 \alpha - \cos^2 \alpha = \cot^2 \alpha \cos^2 \alpha\)

2. Find all solutions to \(\cos \theta = \cot \theta\) in the interval \([0, 2\pi)\).
3. Find the exact value of \( \cos \frac{\pi}{12} \). (Hint: \( \frac{\pi}{12} \) is equal to half of a familiar angle.)

4. Say \( \alpha \) is an angle in quadrant IV such that \( \sin \alpha = -\frac{\sqrt{3}}{3} \), and \( \beta \) is an angle in quadrant II such that \( \sin \beta = \frac{2}{3} \).

   (a) Find the exact value of \( \cos(\alpha - \beta) \).

   (b) Given that \( \sin(\alpha - \beta) = \frac{2}{9} (\sqrt{10} - 1) \), find the quadrant containing the angle \( \alpha - \beta \).
5. Find the exact value of the expression if defined.

(a) \( \cos \left( \arccos \frac{1}{3} \right) \)

(b) \( \tan^{-1} \left( \tan \left( -\frac{\pi}{4} \right) \right) \)

(c) \( \arcsin \left( \sin \frac{5\pi}{6} \right) \)
6. Find all solutions to \( \sin 2u = \sin u \).

7. Find the exact value of the expression if defined.

   (a) \( \cos \left( \tan^{-1} \left( \frac{12}{5} \right) \right) \)

   (b) \( \csc \left( \cot^{-1} \left( \frac{5}{12} \right) \right) \)