Fall 2006 Name ______________________________

Instructor for your Section __________________ Meeting Time ____________________

***NOTE:* A calculator is required, and a notecard is allowed for this exam.**

<u>Part 1:</u> Answer the following multiple-choice questions on the Scan Sheet. Make sure to code your name, WIN number, instructor's name, and form type on the Scan Sheet using a pencil.
(6 pts. each) You may write on this exam.

1. Classify the equation as an identity, a conditional equation, or a contradiction. If the equation is a conditional equation, estimate the smallest strictly positive solution.

$$(\sin x + 2)(\cos x - 5) = 0$$

(a) contradiction
(b) identity
(c) conditional, $x \approx 1.571$
(d) conditional, $x \approx 3.142$
(e) conditional, $x \approx 0.412$

2. Classify the equation as an identity, a conditional equation, or a contradiction. If the equation is a conditional equation, estimate the smallest strictly positive solution.

$$\sin x + \cos x \cot x = \csc x$$

(a) contradiction
(b) identity
(c) conditional, $x \approx 0.524$
(d) conditional, $x \approx 0.785$
(e) conditional, $x \approx 1.047$

3. Classify the equation as an identity, a conditional equation, or a contradiction. If the equation is a conditional equation, estimate the smallest strictly positive solution.

$$\cos(x + \pi) = \cos x - 1$$

(a) contradiction
(b) identity
(c) conditional, $x \approx 1.047$
(d) conditional, $x \approx 2.094$
(e) conditional, $x \approx 3.142$

4. Given that we know the exact values of the sine and cosine functions at $x = \frac{\pi}{6}$ (or 30º) and at $x = \frac{\pi}{4}$ (or 45º), use the sum or difference formulas to find the exact value for $\cos\left(\frac{\pi}{12}\right) = \cos\left(\frac{\pi}{4} - \frac{\pi}{3}\right)$.

(a) none of these (b) $\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{1}{2}$ (c) $\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2}$

(d) $\frac{\sqrt{2}}{2} \cdot \frac{1}{2} - \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2}$ (e) $\frac{\sqrt{2}}{2} \cdot \frac{1}{2} + \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2}$

5. Rewrite using the appropriate sum or difference or other formulas in terms of θ.

$$\sin(3\theta)$$

(a) $3\sin\theta\cos\theta$
(b) none of these
(c) $4\sin\theta\cos^2\theta - \sin\theta$
(d) $3\sin\theta$
(e) $\sin(3)\sin(\theta)$

6. Use the fundamental trigonometric identities to rewrite $\sec x$ in terms of $\sin x$, assuming $0 < x < \frac{\pi}{2}$.

(a) $\sec x = \frac{1}{\sin x}$ (b) $\sec x = \frac{1}{\sqrt{1-\sin x}}$ (c) $\sec x = \frac{1}{\sqrt{1-\sin^2 x}}$

(d) $\sec x = \sqrt{1-\sin^2 x}$ (e) none of these

7. Find the *largest angle* in the triangle with sides $a = 4.0$, $b = 5.0$, and $c = 6.0$.

(a) 97.2° (b) 41.4° (c) none of these (d) 55.8° (e) 82.8°

8. Consider the following SSA Triangle Problem where $A = 69°$, $a = 13$, and $b = 15$. Use the Law of the Sines to solve for the angle B in degrees.

(a) problem has no solution
(b) problem has a unique solution, $B = 90°$
(c) problem has two solutions, $B \approx 54°$ or 126°
(d) problem has two solutions, $B \approx 86°$ or 94°
(e) none of these

9. Two observers are 600 feet apart on level ground. The one observer measures the angle of elevation to a flagpole located between them to be 19º while the other observer on the opposite side measures an angle of elevation of 21º to the flagpole. How high is the flagpole?
(a) 334.5 ft (b) none of these (c) 303.9 ft (d) 108.9 ft (e) 119.9 ft

10. Express the complex number $-2+3i$ in trigonometric form. (Note angles are given in degrees.)

(a) $3.6056(\cos(123.69°) + i\sin(123.69°))$
(b) $3.6056(\cos(56.31°) + i\sin(56.31°))$
(c) $2.2361(\cos(303.69°) + i\sin(303.69°))$
(d) $5(\cos(236.31°) + i\sin(236.31°))$
(e) none of these

11. Use the trigonometric form and De Moivre's Theorem to compute the two square roots of the complex number $-1-i$.

(a) $\sqrt{\sqrt{2}}\left(\cos(67.5°)+i\sin(67.5°)\right)$ and $\sqrt{\sqrt{2}}\left(\cos(247.5°)+i\sin(2472.5°)\right)$
(b) $\sqrt{\sqrt{2}}\left(\cos(67.5°)+i\sin(67.5°)\right)$ and $-\sqrt{\sqrt{2}}\left(\cos(67.5°)+i\sin(67.5°)\right)$
(c) $\sqrt{\sqrt{2}}\left(\cos(112.5°)+i\sin(112.5°)\right)$ and $\sqrt{\sqrt{2}}\left(\cos(292.5°)+i\sin(292.5°)\right)$
(d) $\sqrt{\sqrt{2}}\left(\cos(112.5°)+i\sin(112.5°)\right)$ and $-\sqrt{\sqrt{2}}\left(\cos(112.5°)+i\sin(112.5°)\right)$
(e) none of these

1. Convert the given polar equation $\theta=\frac{\pi}{4}$ into rectangular form.

(a) none of these
(b) $y=x$
(c) $x=0$
(d) $x^2+y^2=\left(\frac{\pi}{4}\right)^2$
(e) $y=0$

<u>Part 2:</u> SHOW YOUR WORK! Write out your solutions to the following three questions, showing clearly how you arrive at your answers.

13. (10 pt) Verify the given identity. $\frac{1}{1-\sin x}=\sec^2 x+\sec x\tan x$

14. (10 pts) Solve this conditional equation for all solutions on the interval $[0, 2\pi)$.

$$\cos 2x+\cos x=0$$

15. (8 pts) Solve the given triangle by any means. Assume angles A, B, and C and sides a, b, and c are labeled in the traditional way. [*Warning:* This is a SSA case which may have no solution, one solution, or two solutions.]

$B = 52°$, $a = 14.5$, and $b = 18.6$

Answers for the Multiple-Choice Questions:
1. a, 2. b, 3. c, 4. c, 5. c, 6. c, 7. e, 8. a, 9. d, 10. a, 11. c, 12. b