THE COLLEGE OF STATEN ISLAND
DEPARTMENT OF MATHEMATICS
MATH 130 – FINAL EXAM Fall 2006

Name_____

Date_____

Answer all questions in the space provided. No credit will be allowed if no work is shown.

Part I – The following ten questions are worth 6 points each.

1. A triangle has the following sides: a=27.6 ft, b=33.7 ft and c=42.4 ft.
Find the measure of the *biggest angle only.*

2. Prove the identity: $\dfrac{1}{\tan\theta+\cot\theta} = \sin\theta\cos\theta$

3. If the $f(x)=\dfrac{3x}{2x-7}$, find $f^{-1}(x)$ and simplify your answer.

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4. Given the complex numbers $Z = 3\,(\cos 60^0 + i \sin 60^0)$. Compute Z^3 first in trigonometric form, then convert your answer to standard form.

Trig Form _____

Standard Form _____

5. If $\cos u = \frac{5}{7}$ and u is in quadrant IV, use suitable identities to find the values of the following: Write answers as fractions:

a) sin 2u b) cos 2u c) tan 2u

sin 2u = _____

cos 2u = _____

tan 2u = _____

6. Simplify $\cos(\tan^{-1} \frac{1}{x})$

_____

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7. Solve the inequality $\frac{(x-3)(x-6)}{x-8} \geq 0$. Write your answer in interval notation.

_____

8. Use synthetic division to find the quotient and the remainder.

$(x^3 - 2x^2 - 8) \div (x+2)$

Quotient _____

Remainder _____

9. Write an equation for a function that has the shape of $y = x^2$, but upside down and shifted 5 units to the right and up 3 units.

_____

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10. Determine the amplitude, period, frequency and phase shift of the function

$y = -\frac{1}{2}\sin(x+\frac{\pi}{2})$. Sketch one period of the function.

Amplitude _____

Period _____

Phase Shift _____

Part II – Answer five (5) of the following: (8 points each). Write the word omit or cross out those questions that you do not wish to answer. If you answer more than 5 questions, only the first 5 will be graded.

11. Solve: $\cos 2x - \sin x = 1$ for all solutions in $[0,2\pi)$

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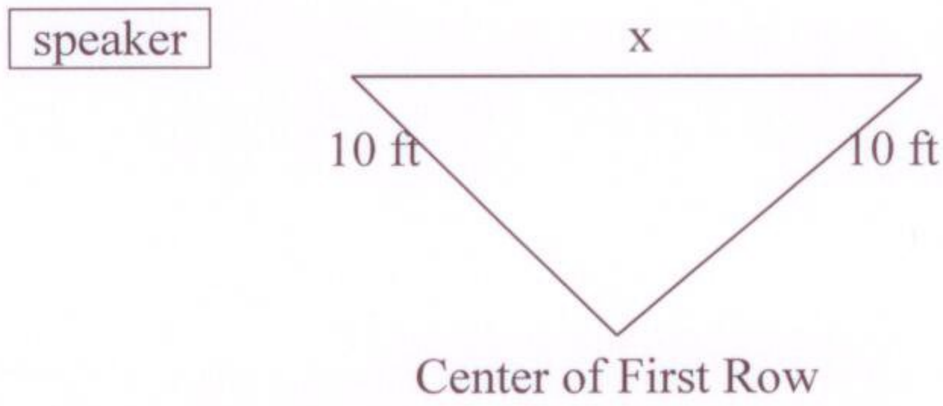
12. In preparation for an outdoor concert, a stage crew must determine how far apart to place the two large speaker columns on stage (see diagram). What generally works best is to place them at 50^0 angles to the center of the first row. The distance from the center of the front row to each of the speakers is ten feet. How far apart does the crew need too place the speakers on stage?



13. For the hyperbola given by $4y^2 - x^2 + 24y + 4x + 28 = 0$ find the center, vertices and the foci. Find equation(s) of asymptote(s). Sketch the curve.

Center _____
Vertices _____
Foci _____
Equation of asymptote(s) _____

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16. Consider the function $f(x) = x^3 + 3x^2 - 2x - 6$

a. Give a complete list of all possible rational zeros. _____

b. Find all the zeros. _____

c. Express f(x) as a product of linear factors: _____

17. Write $\frac{5-3i}{4+3i}$ in the form a+bi _____

Helpful Trigonometric Equations

$$\sin^2\theta+\cos^2\theta=1 \qquad \tan\theta=\frac{\sin\theta}{\cos\theta}$$

$$\tan^2\theta+1=\sec^2\theta$$

$$\cot^2\theta+1=\csc^2\theta \qquad \cot\theta=\frac{\cos\theta}{\sin\theta}$$

$$\sin\theta=\frac{1}{\csc\theta}$$

$$\cos\theta=\frac{1}{\sec\theta}$$

$$\tan\theta=\frac{1}{\cot\theta}$$

$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$\begin{aligned}\cos 2\theta &= \cos^2\theta-\sin^2\theta\\ &= j2\cos^2\theta-1\\ &= 1-2\sin^2\theta\end{aligned}$$

$$\tan 2\theta = \frac{\tan 2\theta}{1-\tan^2\theta}$$

$$\cos(A+B)=\cos A\cos B-\sin A\sin B$$
$$\cos(A-B)=\cos A\cos B+\sin A\sin B$$
$$\sin(A+B)=\sin A\cos B+\cos A\sin B$$
$$\sin(A-B)=\sin A\cos B-\cos A\sin B$$

$$\tan(A+B)=\frac{\tan A+\tan B}{1-\tan A\tan B}$$

$$\tan(A-B)=\frac{\tan A-\tan B}{1+\tan A\tan B}$$

$$\sin\frac{1}{2}\theta=\pm\sqrt{\frac{1-\cos\theta}{2}}$$

$$\cos\frac{1}{2}\theta=\pm\sqrt{\frac{1+\cos\theta}{2}}$$

$$\tan\frac{1}{2}\theta=\pm\sqrt{\frac{1-\cos\theta}{1+\cos\theta}}$$

Circle: $(x-h)^2+(y-k)^2=r^2$

Ellipse: $\dfrac{(x-h)^2}{a^2}+\dfrac{(y-k)^2}{b^2}=1$ *or* $\dfrac{(x-h)^2}{b^2}+\dfrac{(y-k)^2}{a^2}=1$

Parabola: $(x-h)^2=4p(y-k)$ *or* $(y-k)^2=4p(x-h)$

Hyperbola: $\dfrac{(x-h)^2}{a^2}-\dfrac{(y-k)^2}{b^2}=1$ *or* $\dfrac{(y-k)^2}{a^2}-\dfrac{(x-h)^2}{b^2}=1$