O'Bryant

THE COLLEGE OF STATEN ISLAND
Department of Mathematics
Math 130 Final Exam
Fall 2008

Part I: **Answer all questions in this part in the space provided. No credit will be allowed if work is not shown. Each question is worth 6 points.**

NAME:____

1. If $f(x) = \dfrac{4}{x+7}$

   a. Sketch a graph of the function and determine that the function is one-to-one.

   b. Find $f^{-1}(x)$ and simplify your answer.

1.__________

b.__________

2. A triangle has sides which measure $a = 4.3$, $b = 2.5$, $c = 3.8$ Find the measure of the largest angle only to the nearest tenth of a degree.

2.__________

Mth 130 Final Exam (continued)

3. Prove the identity: $\dfrac{\tan(\theta)+\cot(\theta)}{\csc(\theta)}=\sec(\theta)$.

4. Given the complex number $z = 4(\cos(\frac{\pi}{6}) + i\sin(\frac{\pi}{6}))$, compute z^5 first in trigonometric form and then convert your answer to standard form.

4. Trig form __________

Standard form__________

5. Find $\tan(\cos^{-1}\left(\frac{3}{x}\right))$

5.___________

Math 130 Final Exam (continued)

6. If $\tan(\theta) = \frac{-3}{4}$ and θ is in quadrant IV, use suitable identities to find the values of the following:

(No credit will be allowed unless answers are written as fractions.)

$a)\sin 2\theta$ $\quad$ $b)\cos 2\theta$

$\sin 2\theta =$ ___________

$\cos 2\theta =$ ___________

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

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

7. Quotient___________

Remainder___________

Math 130 Final Exam (continued)

8. Solve the inequality $\dfrac{x+1}{x-2} \geq 3$. Write your answer in interval notation.

8.______________

9. Write an equation of a function that has the shape of $y = \sqrt{x}$, but stretched vertically by a factor of 4, then shifted left 2 units and then down 1 unit.

9.______________

10. Determine whether the functions are even, odd or neither.
Explain your answer.

a. $f(x) = x^3 - 5x$

b, $g(x) = x^4 + 3x$

10a.______________

10b.______________

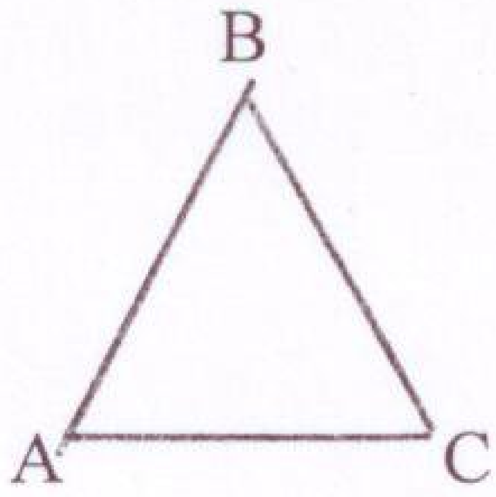
Math 130 Final Exam (continued)

__**Part II:**__ **Answer only five questions in this part (8 points each). Cross out those questions that you do not wish to answer. If you answer more than five questions, only the first five will be graded.**

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

11.________________

12. In the accompanying diagram of $\Delta ABC, A=60^\circ, C=75^\circ$, and the side opposite vertex C is 10m. Find the length of the side opposite vertex B and find the area of ΔABC



12.Side_____________

Area_____________

Math 130 Final Exam (continued)

13. For the ellipse find the center, vertices and foci. Then draw the graph.

$$9x^2 + y^2 - 18x + 4y - 23 = 0$$

13. center______________

Vertices_____________

Foci_________________

14. Solve the following system of equations for x and y:

$$x^2 + 4y^2 = 25$$

$$x + 2y = 7$$

14.______________

Math 130 Final Exam (continued)

15. Simplify: a) $\dfrac{2+5i}{4-i}$

b) $(3+i)(6-4i)$

15a.______________

b.______________

16. Consider the p(x)= $x^3 - 2x + 4$.

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

16.a)__________________

b) Find all the zeros

b)__________________

Math 130 Final Exam (continued)

17. Consider the function: $f(x) = \dfrac{2x - 5}{x^2 + 3x - 10}$

a) The coordinates of the x-intercept(s) 17a)__________________

b) The coordinates of the y-intercept(s) b)__________________

c) The equation(s) of the vertical asymptote(s) c)__________________

d) The equation(s) of the horizontal asymptote(s) d__________________

e) Sketch the graph of f(x) together with all the points and lines found above.

Math 130 Final Exam (continued)

18. Given that y = $4\cos(2x - \frac{\pi}{4})$,

find the following:

a) The amplitude 19 a)________________

b) The period b)________________

c) The phase shift c)________________

d) Sketch the graph d)________________

SCRAP PAPER

Formulas

Area of Triangle

$K = \frac{1}{2} ab \sin C$

Functions of the Sum of Two Angles

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

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

Functions of the Difference of Two Angles

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

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

Law of Sines

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Law of Cosines

$a^2 = b^2 + c^2 - 2bc \cos A$

Functions of the Double Angle

$\sin 2A = 2 \sin A \cos A$ $\quad$ $\cos 2A = \cos^2 A - \sin^2 A$

$\cos 2A = 2\cos^2 A - 1$ $\quad$ $\cos 2A = 1 - 2\sin^2 A$

Functions of the Half-Angle

$\sin \frac{1}{2} A = \pm\sqrt{\frac{1 - \cos A}{2}}$ $\quad$ $\cos \frac{1}{2} A = \pm\sqrt{\frac{1 + \cos A}{2}}$

Conic Sections

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

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

$\frac{(x - h)^2}{b^2} + \frac{(y - k)^2}{a^2} = 1$

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

$(y - k)^2 = 4p(x - h)$

Hyperbola: $\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1,$

$\frac{(y - k)^2}{a^2} - \frac{(x - h)^2}{b^2} = 1$

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

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1,$$

$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$$

$$(x-h)^2 = 4p(y-k),$$

$$(y-k)^2 = 4p(x-h)$$

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1,$$

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

Important Properties and Formulas

Basic Identities

$$\sin x = \frac{1}{\csc x}, \qquad \sin(-x) = -\sin x,$$

$$\cos(-x) = \cos x,$$

$$\cos x = \frac{1}{\sec x}, \qquad \tan(-x) = -\tan x$$

$$\tan x = \frac{1}{\cot x},$$

$$\tan x = \frac{\sin x}{\cos x},$$

$$\cot x = \frac{\cos x}{\sin x},$$

Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1,$$

$$1 + \cot^2 x = \csc^2 x,$$

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

Sum and Difference Identities

$$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v,$$

$$\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v,$$

$$\tan(u \pm v) = \frac{\tan u \pm \tan v}{1 \mp \tan u \tan v}$$

Cofunction Identities

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x,$$

$$\tan\left(\frac{\pi}{2} - x\right) = \cot x,$$

$$\sec\left(\frac{\pi}{2} - x\right) = \csc x,$$

$$\sin\left(x \pm \frac{\pi}{2}\right) = \pm\cos x,$$

$$\cos\left(x \pm \frac{\pi}{2}\right) = \mp \sin x$$

Double-Angle Identities

$$\sin 2x = 2 \sin x \cos x,$$

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

$$= 1 - 2\sin^2 x$$

$$= 2\cos^2 x - 1,$$

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

Half-Angle Identities

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

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

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

$$= \frac{\sin x}{1+\cos x}$$

$$= \frac{1-\cos x}{\sin x}$$

Inverse Trigonometric Functions

FUNCTION	DOMAIN	RANGE
$y = \sin^{-1} x$	$[-1, 1]$	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
$y = \cos^{-1} x$	$[-1, 1]$	$[0, \pi]$
$y = \tan^{-1} x$	$(-\infty, \infty)$	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

(continued)