DEPARTMENT OF MATHEMATICS
BROOKLYN COLLEGE

FINAL EXAMINATION - SPRING 2010
MATHEMATICS 2.9

INSTRUCTIONS: Do **ALL** in Part I and any **FIVE** in Part II. Show all work.

PART I: Do all TEN problems 1-10. Each is worth 5 points.

1. Find the domain for the function $f(x) = \frac{\sqrt{6-3x}}{x+4}$.

2. Find an equation for the line through the point $(-1, 4)$ and perpendicular to the line $4x + 3y = 9$.

3. Find the exact value of $\log_3 \frac{1}{27} + (16)^{-\frac{3}{4}}$.

4. Express $\frac{2+i}{3-2i}$ in the form $a+bi$, where a and b are two real numbers.

5. Solve the inequality $|2x+5| \geq 3$. Graph the answer on the number line.

6. Find the center and radius of the circle $x^2+y^2+6x-4y-12=0$. Sketch the circle.

7. Find the term involving x^4 in the expansion of $(\frac{x^2}{3}-3y)^7$.

8. If θ is in the second quadrant and $\tan\theta = -\frac{3}{4}$, find $\sin\theta$ and $\cos 2\theta$.

9. Sketch the graph of $y = -3\sin 2x$ from $x = 0$ to $x = 2\pi$. Indicate all intercepts and its amplitude.

10. Sketch the graph for $y = -x^2 - 2x + 3$. Indicate the vertex, x- and y- intercepts.

PART II: Do any FIVE of the problems 11-17. Each is worth 10 points.

11. Let $f(x) = 5x - 4$ and $g(x) = \frac{2x}{x+3}$. Find :
    (a) $(g \circ f)(x)$ (b) $(f \circ g)(2)$ (c) $f^{-1}(x)$ (d) $g^{-1}(x)$

12. (a) Solve the inequality $\frac{x-1}{x+3} \leq 0$.

    (b) Solve the equation $\log_4(x+5) + \log_4(x-1) = 2$ and check your answers.

13. (a) Let $f(x) = x^2 + 3$. Simplify $\frac{f(x+h)-f(x)}{h}$.

(b) Use the Rational Root Theorem to list all possible rational roots of the equation $2x^3 - x^2 + 6x - 3 = 0$, and then find all roots (real or complex) of the equation. (Hint: One of the roots is a positive rational.)

14. (a) Find the exact value of $\tan(\arccos(-\frac{5}{13}))$.

(b) Find the center, vertices and foci of the ellipse:

$$\frac{(x-2)^2}{25} + \frac{(y+3)^2}{9} = 1$$

Sketch the ellipse.

15. (a) Solve the equation $\sqrt{4x+1} - x = 1$ and check your answers.

(b) Let $f(x) = \frac{2x+3}{x-1}$. Find the vertical and horizontal asymptotes, x- and y-intercepts, and sketch the graph.

16. (a) Solve the equation $5^{x^2-1} = 25^{x+1}$.

(b) Verify the identity $\tan\theta + \cot\theta = \frac{2}{\sin 2\theta}$.

17. (a) Find an equation for the circle taking the line segment between two points $P(-4,-1)$ and $Q(2,7)$ as a diameter.

(b) Find $\cos(A+B)$ if A is in the second quadrant with $\sin A = \frac{3}{5}$ and B is in the first quadrant with $\cos B = \frac{12}{13}$.