DEPARTMENT OF MATHEMATICS
BROOKLYN COLLEGE

FINAL EXAMINATION of FALL 2010
MATHEMATICS 2.9/1011

Name:

INSTRUCTIONS: Answer **10** out of **11** problems. Show all work.

1. a) Find an equation for the line through the point $(-5, -3)$ and which is perpendicular to the line $5x - 6y = 9$.

b) Find the domain of $f(x) = \frac{\sqrt{x+4}}{x^2-1}$.

2. a) Sketch: $x^2 + y^2 - 14x + 10y + 65 = 0$.

b) Find the term involving $x^8$ in the expansion of $(3x^4 - 2)^5$.

3. a) Sketch: $\frac{(x-1)^2}{9} + \frac{(y+4)^2}{25} = 1$.

b) Find the exact value of $\tan(\arccos(-\frac{2}{3}))$.

4. a) Sketch: $y = -2x^2 + 8x - 6$. Indicate all intercepts.

b) Find the range of $f(x) = 8^x - 32$.

5. a) Let $f(x) = 3x^2 - 5x + 7$. Find and simplify the quotient $\frac{f(x+h)-f(x)}{h}$.

b) Let $A$ be in the fourth quadrant and let $\csc A = \frac{-13}{12}$. Let $B$ be in the third quadrant and let $\cot B = \frac{4}{3}$. Find $\cos(A + B)$.

6. a) Use the rational root test to find all the roots of

$$P(x) = x^3 + 3x^2 + 7x + 5,$$

and factor $P(x)$.

b) Express $\frac{-1+7i}{4+3i}$ in the form $a+bi$, where $a$ and $b$ are two real numbers.

7. a) Sketch: $y = \frac{3x-1}{x+5}$. Indicate all intercepts and asymptotes.

b) Solve: $|3 - 4x| \leq 5$.

8. a) Solve for $x$: $\log_3(x^2 - 7) - \log_3(x - 1) = 1$.

b) Solve for $x$: $\sqrt{4x + 5} + x = 4$.

9. a) Verify the following identity: $\frac{1-\cos 2\theta}{\sin 2\theta} = \tan\theta$.

b) Solve for $x$: $4^{x^2+2} = 8^{x+1}$.

10. a) Graph: $y = -4\cos 2x$, $0 \leq x \leq 2\pi$. Indicate all intercepts.

b) Find the exact value of $(\sec(\frac{\pi}{4}))^{-6} + \log_7 \sqrt{7}$.

11. a) Given that $f(x) = \frac{3-4x}{2x+9}$ is a one-to-one function, find its inverse.

b) Let $f(x) = 4x^2 - 2x$ and $g(x) = \frac{1}{\sqrt{x}}$.
Find: (i) $(f \circ g)(4)$ and (ii) $(g \circ f)(x)$.

**Please indicate which problem you omitted.**