Department of Mathematics **The City College of New York**
Math 19000 **Final Examination** **Spring 2005**

Instructions: This Exam consists of two parts.
In Part I you must do all 5 questions.
In Part II choose any 5 complete questions.
A scientific calculator is required for some questions. Graphing calculators are not permitted. **Show all work.**

Part I. Do all 5 questions.

1. Simplify completely each of the following. Your answers should be fractions that are completely reduced.

a) $\dfrac{1-\dfrac{4}{x^2}}{1+\dfrac{4}{x}-\dfrac{4}{x^2}}$

b) $\dfrac{2x^2-3xy-2y^2}{12x-12y} \div \dfrac{x^2-xy-2y^2}{x^2-y^2}$

2. $\dfrac{3x}{x^2-4x+3}-\dfrac{2x+1}{x^2-1}$

3. a) $\dfrac{5\sqrt{x}-2}{2+5\sqrt{x}}$

b) Solve: $\dfrac{1}{x-2}-\dfrac{1}{x}=\dfrac{1}{3}$

4. a) $\left(\dfrac{27x^{-5}y^{9/8}}{x^{3/2}}\right)^{-\frac{4}{3}}$

b) $3x^5y\sqrt{72x^8y^{27}}-7x^2y^{12}\sqrt{18x^{14}y^5}$

5. Solve the equation $\sqrt{17-4x}-7=x$ and check your answers.

End of Part I. You should have answered all questions from this Part.

Please turn the page for Part II.

Part II. Choose any 5 complete questions (omit 2).

6. Find the center and radius of the circle whose equation is $4x^2 + 4y^2 + 52 = 40x - 24y$.

Solution: center (5,-3) radius $\sqrt{21}$

7. Solve for x only. $\begin{cases} x + 4y - z = 0 \\ x + y + z = 4 \\ 3y - z = -1 \end{cases}$

8. The sum of an integer and twice its reciprocal is $\frac{27}{5}$. Find the integer.

Solution: the integer is 5

9. a) Find the midpoint of the line segment joining (-2,-1) and (-8,6).

b) Find an equation of the line through point (-4,8) that is perpendicular to the line $2x - 3y = 1$.

10. **a)** In triangle ABC, angle A measures 31 degrees, angle B measures 111 degrees, and the length of side AB is 15 centimeters. Find the length of side AC, correct to two decimal places.

b) Given A is an acute angle with cot A=$\frac{4}{3}$, then show that csc A=$\frac{5}{3}$.

11. Find (to the nearest degree) the largest angle of a triangle whose sides measure 5 inches, 8 inches, and 12 inches.

12. Given the function, $f(x) = 3 - 5x - 2x^2$ find and simplify

(a) $f(-7)$ and

(b) $f(1-2a) - f(6a)$