Name: _____ CUNY ID#: _____

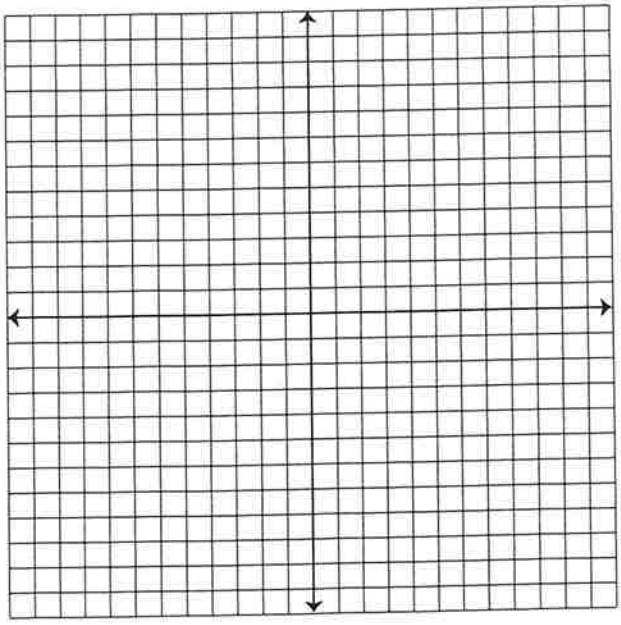
QUEENS COLLEGE DEPARTMENT OF MATHEMATICS

Math 115 Final Exam – Fall 2025
Time: 2 hours and 30 minutes

Directions: Answer all questions and show all your work in the space provided. For each question, write your final answer in the box if one is provided. Solutions must be fully simplified and in algebraic form. Calculators are **not** allowed on this exam. 150 points total.

1. Consider a line L passing through the points $(-3,3)$ and $(3,5)$.
   a. (6 points) Write an equation of this line in slope-intercept form.

   b. (6 points) Sketch the graph of this line. Label the coordinates of the x-intercept and the y-intercept.



c. (6 points) Find an equation of a line perpendicular to the line L found in part a that passes through $(2, 4)$.

2. Consider the function $f(x) = 2x^2 - 4x + 5$. Find and simplify the following expressions:

a. (1 point) $f(a)$

$f(a) =$

b. (3 points) $f(2a)$

$f(2a) =$

c. (4 points) $2f(a) - f(2a)$

$2f(a) - f(2a) =$

3. Consider the function $g(x) = \frac{1}{\sqrt{x+5}}$.

a. (4 points) Write the domain of $g(x)$ in interval notation.

The domain is

b. (6 points) Evaluate $g(7)$. Rationalize the denominator of the result.

$g(7) =$

4. (4 points each) Factor completely or write PRIME.

a. $4x^2 + 11x - 3$

b. $5x^3 + 20x^2 - 10x$

c. $x^3 - x^2 - 16x + 16$

5. (6 points each) Find all real solutions for each of the following equations.

a. $x^2 + 8x = -4$

$x =$ ☐

b. $x - \frac{16}{x-5} = \frac{-5x}{x-5}$

$x =$ ☐

c. $3\sqrt{2x+1} - 17 = -8$

$x =$ ☐

6. (8 points each) Simplify the following expressions.

a. $\frac{6x^2-x-1}{2} \div \frac{4x^2-1}{8x+4}$

b. $\frac{8x}{x^2-16} + \frac{4}{4-x}$

c. $\dfrac{\frac{2}{a+h}-\frac{2}{a}}{h}$

7. (8 points) Simplify and write your answer using only positive exponents.

$$\frac{(9x^2)^{-\frac{1}{2}}(27y^4)^{\frac{1}{3}}}{2x^{-1}y^{\frac{1}{3}}}$$

8. (4 points) Solve the equation $4 = \frac{2x-1}{y}$ for x.

$x =$

9. (8 points) Solve the following system of equations using any algebraic method. If there is no solution, write "No Solution"; if there are infinite solutions, write "Infinite Solutions".

$$\begin{cases} -2x - 6y = -8 \\ 3x + 9y = 1 \end{cases}$$

10. (10 points) Rationalize the denominators and simplify the result.

$$\frac{5}{2-\sqrt{3}} - \frac{15+6\sqrt{2}}{\sqrt{3}}$$

11. Consider the quadratic function $f(x) = -x^2 + 4x + 5$.

a. (2 points) Evaluate $f(-2)$.

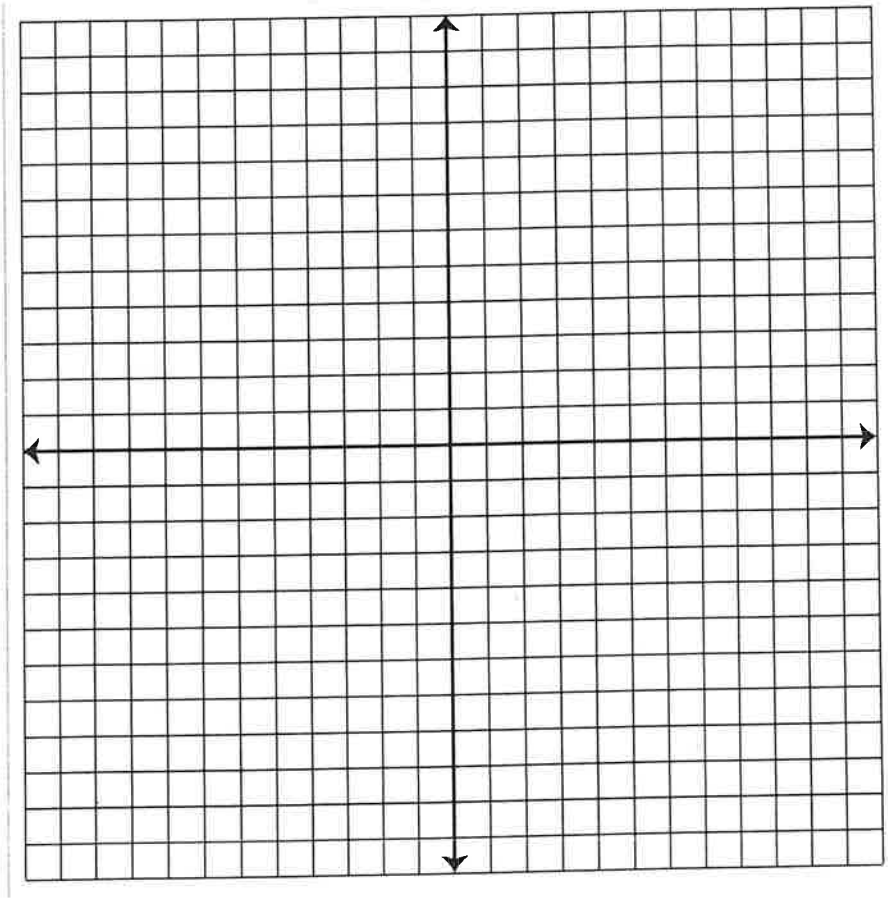
$f(-2) =$ ☐

b. (2 points) The coordinates of the vertex are ☐

c. (4 points) The coordinates of the x-intercept(s) are ☐

d. (2 points) The coordinates of the y-intercept are ☐

e. (4 points) Sketch the graph of the function $f(x)$.



f. (2 points) The domain (in interval notation) of $f(x)$ is

g. (2 points) The range (in interval notation) of $f(x)$ is

12. (6 points) Use long division to divide $\frac{x^4 - 5x^2 + 13x + 3}{x + 3}$.

The quotient is

The remainder is

13. A circle centered at $(-3,5)$ passes through the point $(0,1)$.
    a. (3 points) Find the radius of the circle.

The radius is

    b. (3 points) Write an equation of the circle in standard form.

An equation is