Math 110 Exam #1
September 30, 2015

Time: 1 hour and 25 minutes
Instructions: Show all work for full credit. No outside materials or calculators allowed.
Extra Space: Use the backs of each sheet for extra space. Clearly label when doing so.

Name: _____

ID #: _____

Instructor/Section: _____

"I pledge by my honor that I have abided by the NJIT Academic Integrity Code."

_____ (Signature)

Problem(s)	Score	Total

Relevant Formulas for this Exam:

Population Growth Formula: $P(t) = P_0 e^{kt}$

Where P(t) is the population at time t, P_0 is the initial population at t=0, and k is the growth rate constant if k>0 or decay rate if k<0.

1. Solve the following system of equations for all solutions **(8 points)**:

$x^2 + y^2 = 13$
$2x - 3y = 0$

2. Solve the following system of equations in terms of the unknown non-zero constants a and b. Simplify any complex fractions. **(8 points)**

$ax + by = 4$
$2bx - ay = 0$

Circle for Unacceptably Messy/Disorganized Work: –1 Point

Circle for Work with Superior Organization/Neatness: +1 Point

3. Solve the following system of equations **(10 points)**:

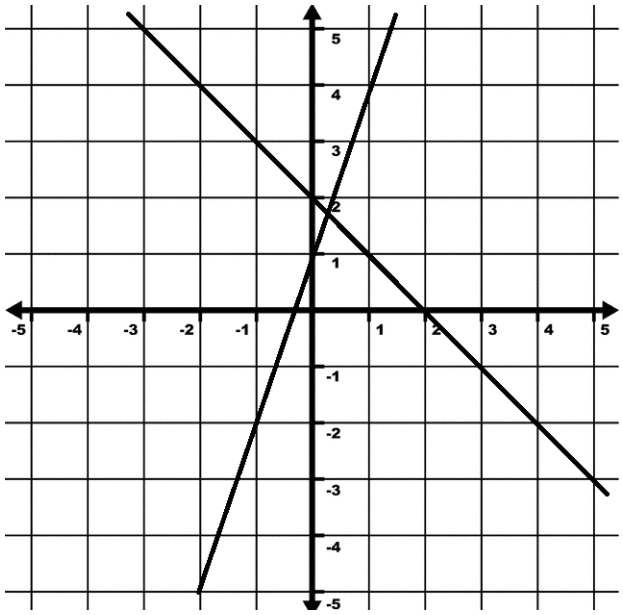
$$\begin{aligned} 2x - y - z &= 2 \\ 3x - 2y + z &= -1 \\ y + 2z &= 1 \end{aligned}$$

4. Suppose that $\log_5 x = \frac{2}{3}$ and $\log_5 y = 3$, evaluate $\log_5 \left(xy^2\right)^{1/30}$ **(5 points)**

Circle for Unacceptably Messy/Disorganized Work: –1 Point

Circle for Work with Superior Organization/Neatness: +1 Point

5. Find the point at which the following two lines intersect **(10 points)**



6. As of 2014, the population of Africa was growing steadily at 2.5% per year. The population at this time was estimated to be 1.1 billion. How many years will it take this population to triple in size? Note, without a calculator you may have to leave your answer in the form of a logarithm or an exponential. **(5 points)**

7. Find the partial fraction decomposition of the following rational expressions and simplify your answer including any complex fractions: **(20 pts)**

a) $\dfrac{1}{x^3 + x}$

b) $\dfrac{x-4}{(x+3)(x-1)^2}$

Circle for Unacceptably Messy/Disorganized Work: –1 Point

Circle for Work with Superior Organization/Neatness: +1 Point

8. Solve for k in terms of the other variables and fully simplify. Assume all variables are positive numbers. **(8 points)**

a) $P = \dfrac{M}{1+e^{-kt}}$

b) $\dfrac{1}{R} + \dfrac{2}{k} = \dfrac{1}{3}$

Solve the following equations for all solutions: **(8 points, no partial credit)**

c) $x^3 = 16x$

d) $4x^{3/2} - 32 = 0$

9. Solve the following equations for ALL solutions, making sure all answers are in the domain of the original problems. **(18 points)**

a) $4^{x^2} \bullet \left(\frac{1}{16}\right)^{x} = 2^5$

b) $\log_7(x+1) + \log_7(2x) = \log_7(3x+1)$

c) $\log_2(x^{11}) + 3 = 47$

Circle for Unacceptably Messy/Disorganized Work: –1 Point

Circle for Work with Superior Organization/Neatness: +1 Point