MTH 162
Exam 1, Form A
Fall 2015

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible.

No TI-89s.

The following formulas may or may not be useful:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \qquad x = \frac{-b}{2a}$$

$$\log_a(MN) = \log_a M + \log_a N, \qquad \log_a(M/N) = \log_a M - \log_a N, \qquad \log_a(M^N) = N \log_a M$$

$$\log_b x = \frac{\log_a x}{\log_a b} = \frac{\ln x}{\ln b} = \frac{\log x}{\log b}$$

$$I = Prt, \qquad S = P + I$$

$$a_n = a_1 + (n-1)d, \qquad s_n = \frac{n}{2}(a_1 + a_n)$$

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1. (12 pts.) Perform the indicated operation and simplify.

$$\frac{x^2 + 8x + 12}{x^2 + x - 2} \div \frac{x^2 + 4x + 3}{x^2 - 1}$$

2. (12 pts.) Use any method to find the exact real solutions, if they exist.

$$(x+9)(x-5)=24$$

3. (12 pts.) The profit function for a certain commodity is $P(x) = -x^2+80x-300$. Find the level of production that yields maximum profit, and find the maximum profit.

4. (16 pts.) For the following linear programming problems,
(a) graph the feasible region,
(b) find all corner points of the feasible region, and
(c) maximize or minimize the function as directed.

Maximize $f = 4x + 3y$ subject to

$$\begin{aligned} 2x + \ \ y &\geq 12 \\ x + 5y &\leq 15 \\ x &\geq \ \ 0 \\ y &\geq \ \ 0 \end{aligned}$$

5. (12 pts.) The Corner Bakery makes two cakes: Frosted Angel Cake and Chiffon Cake. Each cake is made from sugar and flour (and other ingredients that we will ignore). The Frosted Angel Cake requires 1 cup of sugar and 2 cups of flour, while the Chiffon Cake uses 5 cups of sugar and 3 cups of flour. There are 200 cups of sugar and 134 cups of flour on hand.

Write the system of inequalities that describes the constraints on the number of each type of cake to be made. Begin by identifying what x and y represent.

Don't graph the inequalities or find the corners. Just say what x and y represent, and write the inequalities. That's all.

(Here is additional *optional* information that you do not need to use; I'm only stating this because it might help you understand the setting: A Frosted Angel Cake will sell for \$4, while a Chiffon Cake will sell for \$9. The bakery would want to know how many of each cake will maximize revenue; however, don't go on to figure that out.)

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6. (12 pts.) (a) Solve for x by writing the equation in exponential form.

$$\log_5(4x - 11) = 2$$

(b) Use the properties of logarithms to write the expression as a single logarithm.

$$\log_3(x + 5) + 4\log_3 x$$

7. (12 pts.) The demand function for a certain commodity is given by $p = 250e^{-q/4}$.

(a) At what price per unit with the quantity demanded equal 8 units?

(b) If the price is \$5.16 per unit, how many units will be demanded, to the nearest unit?

8. (12 pts.) Find the 200th term of the arithmetic sequence with first term 15 and ninth term 39.