Math 120 B and C - Autumn 2005
Mid-Term Exam Number One
October 20, 2005

Name: _____ Section: _____

1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

- Complete all questions.
- You may use a calculator during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.
- If you use a trial-and-error or guess-and-check method, or read a numerical solution from a graph on your calculator when an algebraic method is available, you will not receive full credit.
- You may use one hand-written 8.5 by 11 inch page of notes.
- Show all work for full credit.
- You have 50 minutes to complete the exam.

.

1. Let $g(x) = 3x - 7$. Suppose $h(x) = g(f(x))$ and that $f(x)$ is a linear function.
   If $h(x) = 5x + 2$, find $f(x)$.

2. Let

$$f(x) = \begin{cases} 2x + 19 & \text{if } x \leq 0 \\ x^2 & \text{if } 0 < x < 5 \\ 3x - 6 & \text{if } x \geq 5 \end{cases}$$

Find all solutions to the equation $f(x) = 57$.

3. The city of Trem had a population of 19,000 in the year 1980, and a population of 24,000 in the year 2005. Assume that the population of Trem is growing according to a linear model.

   The population of the city of Nurg in the year t is given by the function

   $$N(t) = 260t - 500800.$$

   For example, the population of Nurg in 1990 is equal to $N(1990) = 16600$.

   When will there be 10 percent more people in Nurg than in Trem?

4. Gloria is planning to ride her bicycle near the transmitter of a radio station. She will be riding from a point 10 miles due east of the transmitter, and will ride to a point 35 miles west and 7 miles north of the transmitter. She has a radio on her bicycle which can pick up the station as long as she is within 10 miles of it.

   If she rides at a constant speed of 16 miles per hour, for what length of time during her ride will she be able to listen to the radio station?

5. As a certain species of tree grows, the number of leaves changes with the height. When the tree is 10 feet tall, it has 970 leaves per vertical foot of its height. When the tree is 30 feet tall, it has 800 leaves per foot. Assume that the number of leaves per foot is a linear function of the height of the tree.

   At what height is the total number of leaves on the tree as large as it can possibly get?