Math 120 C - Autumn 2009
Mid-Term Exam Number Two
November 19, 2009

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1	10	
2	10	
3	10	
4	10	
Total	40	

- Complete all four questions.

- You may use a scientific calculator during this examination. Graphing calculators are not allowed. Also, other electronic devices are not allowed, and should be turned off and put away for the duration of the exam.

- If you use a trial-and-error or guess-and-check method 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. Write your name on your notesheet and turn it in with your exam.

- Show all work for full credit.

- You have 50 minutes to complete the exam.

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1. Azami has 300 meters of fencing with which to build a rectangular enclosure. On one side, she will leave gap so she can move things in and out of the enclosure. The gap will be one-third the length of that side. For example, the enclosure might look like this:

What dimensions should the enclosure have to maximize the area of the enclosure?

2. In 1980, the city of Kolamto had a population of 30,000. Kolamto's population doubles every 20 years.

   In 1990, the population of the city of Jubnit was half that of Kolamto. In 2005, Jubnit's population was 75% as large as the population of Kolamto.

   Assuming that Jubnit's population is growing exponentially, when will the population of Jubnit reach 300,000? Give your answer in years after 1980.

3. Leon works with weights every afteroon at the IMA. He has found that the amount of weight he can lift is a linear-to-linear rational function of the number of calories he ate for lunch. If he eats nothing (0 calories), he can lift 75 kg.

If he eats 400 calories, he can lift 90 kg.

The more he eats for lunch, the more he can lift, but he is never able to lift more than 120 kg.

If he eats 300 calories for lunch, how much will he be able to lift?

4. Let $f(x) = 6x - 1$ and $g(x) = 2x - 3$.

   (a) Compute the composition $f(g(x))$.

   (b) Let $h(x) = g(f(x))$. Find $h^{-1}(x)$.

   (c) Let $j(x) = (f(x))^2$. Find the fixed points of $j(x)$.