Math 120 A, B Autumn 2012
Mid-Term Exam Number Two
November 15, 2012

Name: ____________________ Student ID no. : ____________

Signature: ________________________ Section: __________

1	10	
2	10	
3	10	
4	10	
Total	40	

- Complete all four questions.
- Show all work for full credit.
- 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.
- You have 50 minutes to complete the exam.

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1. Bob and Maria are moving in the xy-plane. They move along straight lines at constant speeds. They start moving at the same time. Maria starts from the origin and heads toward the point $(15, 12)$, reaching it in 3 seconds. Bob leaves the point $(8, 0)$ and heads toward the point $(0, 2)$, reaching it in 4 seconds.

   (a) Give Maria's parametric equations of motion.

   (b) Give Bob's parametric equations of motion.

   (c) How long have Bob and Maria been moving at the instant when they are closest together?

2. The mass of Bob's pancreas is a linear-to-linear function of time. Today, it is 60 grams. Ten days from now, it will be 105 grams. Also, 170 days from now, it will be 145 grams.

   When will Bob's pancreas have a mass of 75 grams? Give your answer in days from today.

3. The city of Arg has a rat problem. In the year 2000, the population of Arg was 8000 and it grows at the rate of 5.4% per year. In 2005, there were half as many rats as people in Arg, but the number of rats triples every 12 years.

   When will there be twice as many rats as people in Arg? Give your answer in years after 2000.

4. (a) Let $f(x) = 3x - 1$. Suppose the graph of a function $b(x)$ is the graph of $f(x)$ shifted 3 units to the right and 6 units up. Give the rule for $b(x)$.

(b) Let $g(x) = x + \sqrt{x^2 - 4}, x \geq 2$. Find $g^{-1}(x)$ and specify its domain.

(c) Let $f(x) = 3x - 1$. Find a function $h(x)$ such that the function $k(x) = f(h(x))$ has $x = 5$ as a fixed point.