Math 120 A - Spring 2013
Mid-Term Exam Number Two
May 23, 2013

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.

.

1. The older Magdalena gets, the taller she gets. At the age of 5, she was 70 cm tall. At the age of 30, she was 160 cm tall. She will always get taller, and her height will approach, but never exceed 200 cm.

   Suppose her height is a linear-to-linear rational function of time.

   (a) Find a function that gives her height as a function of time.

   (b) At what age will Magdalena be 173 cm tall?

2. Akira is running around a circular track. Akira runs counterclockwise. From where he starts, it takes him 18 seconds to reach the easternmost point of the track. It takes him 80 seconds to run one complete lap.

   (a) Let r stand for the radius of the track. With a coordinate system imposed so that the origin is at the center of the track, express Akira's x- and y- coordinates as functions of the time, t, since he started running (your expressions will involve r).

   (b) Bob starts running at the same time as Akira. Bob starts from the westernmost point and runs clockwise. Bob and Akira pass each other for the first time after 30 seconds. How long does Bob take to run one lap of the track?

3. The population of city A increases by 1.9% each year. In the year 2000, city A's population was 10,000.

   City B's population doubles every 18 years. In the year 2005, there were twice as many people in city A as there were in city B.

   When will the populations of the two cities be equal? Give your answer in years after the year 2000.

4. (a) Let $d(x) = 5x - 6$ and $r(x) = 2x + 4$. Solve the equation $d(r(x)) = 1$.

(b) Let $k(x) = x^2 - 9x + 21$. Find the fixed points of $k(x)$.

(c) Let $f(x) = 2x - 7$. Find a function $g(x)$ such that $f(g(x)) = 8x - 3$.