Math 120 A, B - Winter 2011
Mid-Term Exam Number Two
February 24 , 2011

Name: _____ Student ID no. : _____

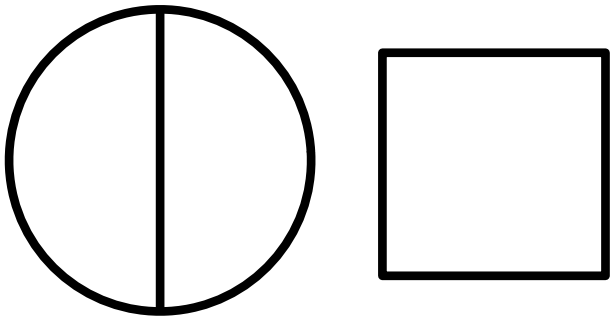
Signature: _____ Section: _____

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. Graphic 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.

.

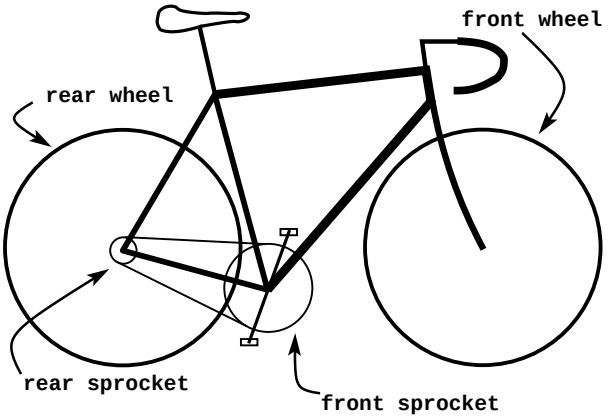
1. You have 1000 meters of fencing with which to build two enclosures. One will be a circle, and the other will be a square. The circular enclosure will also have a partition which is the length of the circle's diameter. For example, your enclosures might look like this:



   (a) What should the radius of the circle be to minimize the combined area of the circle and square?

   (b) What should the radius of the circle be to maximize the combined area of the circle and square?

2. A bicyclist is riding at 27 km/hour. She is pedaling at 95 rpm. Her rear wheel has radius 0.34 m and her rear sprocket has radius 0.03 m.



(a) What is the radius of her front sprocket?

(b) Through what angle (in DEGREES) does her rear wheel rotate in 0.004 second?

3. (a) Give an example of a linear to linear rational function with fixed points $x = -1$ and $x = 4$.

(b) Let $f(x) = x^2 - 4x + 7, x \leq 2$. Find $f^{-1}(x)$.

4. The population of city A increases by 2.5% each year.

   In 2005, city A's population was 5,000.

   City B's population triples every 40 years.

   In 2010, there were 4000 more people in city A than in city B.

   When will the populations of city A and city B be equal? Express your answer in years after 2005.