Math 120 A Spring 2011
Mid-Term Exam Number One
April 21, 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.

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1. Vera is running. She starts from a point which is 120 feet due north of a broken water main. She runs directly toward a point 600 feet east of the broken water main and will reach it after 60 seconds.

   (a) Impose a coordinate system with the origin at the broken water main. Express Vera's x and y coordinates as functions of t, the length of time she has been running.

   (b) The water main started leaking at the moment that Vera started running. The puddle created by the water main is circular, centered on the water main, and has a radius which grows at 12 feet per second. Determine when Vera's feet get wet.

2. Helga has a job. Her regular pay rate is 10 dollars per hour. However, for the time she works between 8 hours and 12 hours in a day, she will be paid 15 dollars per hour. For time she works over 12 hours in a day, she will be paid 20 dollars per hour.

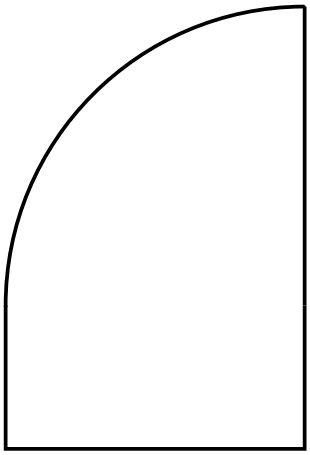
   (a) Express the amount of money Helga earns in a work day as a multipart function $M(x)$ of the number of hours x she works that day.

   (b) Steve has a different job. His job pays 11.50 dollars per hour regardless of how many hours in a day he works. One day, Steve and Helga work for the same amount of time and make the same amount of money. How many hours did Helga work on that day?

3. The town of Baarn is located 30 km WEST and 20 km NORTH of the town of Cuijk. The town of Delft is located 50 km EAST and 10 km SOUTH of Cuijk.

   A train track follows a straight line from Baarn to Delft. How close does the track come to Cuijk?

4. You are creating a window with the shape of a rectangle with a quarter circle on top. An example is shown in the figure below.



The perimeter will be 100 cm. What is the maximum possible area for the window?