

Math 120 A, B - Winter 2009  
Mid-Term Exam Number Two  
February 26, 2009

Name: \_\_\_\_\_ Student ID no. : \_\_\_\_\_

Signature: \_\_\_\_\_ Section: \_\_\_\_\_

1	10	
2	10	
3	10	
4	10	
Total	40	

- Complete all four questions.
- 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, or read a numerical solution from a graph on your calculator 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.

1. Let  $f(x) = \sqrt{x}$ , and  $g(x) = 2x + x^2$ .

The function  $h(x) = g(f(x))$  is one-to-one. Find  $h^{-1}(x)$ .

2. Mr. X prepared to jump across the English Channel. The more he prepared, the further he was able to jump. The length of his jump was a linear-to-linear function of the number of hours that he prepared. After preparing for 10 hours, he was able to jump 10 feet. After he prepared 10 more hours, he could jump 20 feet. After an additional 10 hours of preparation, he could jump 25 feet.

(a) (8 points) If he prepared for a total of 55 hours, how far could Mr. X jump?

(b) (2 points) The English Channel is about 110,000 feet across at its narrowest point. With sufficient preparation, could Mr. X jump across it? Why or why not?

3. Yuri and Tatiana are running around a circular track. Yuri runs clockwise and Tatiana runs counterclockwise.

(a) (7 points) Yuri runs at 3 meters per second and takes 100 seconds to complete a lap of the track. From where he starts, it takes him 62 seconds to reach the southernmost point of the track. After running for 33 seconds, how far is Yuri, in a straight line, from the northernmost point of the track?

(b) (3 points) Tatiana starts running at the same time as Yuri starts running. Tatiana starts from the westernmost point of the track. She takes 90 seconds to complete a lap of the track. When will she pass Yuri for the first time?

4. The depth of water in a certain well is a sinusoidal function of time. At 3 AM one day, the water was at its maximum depth: 20 meters deep. The depth of water then decreased, and reached a minimum of 17 meters; the depth then increased, and reached the maximum depth again at 6:30 PM that day.

On that day, what was the depth of the water at 9 AM?