

Math 120 A, B Winter 2013
Final Exam
March 16, 2013

Name: _____

Student ID no. : _____

Signature: _____

Section: _____

1	10	
2	10	
3	15	
4	10	
5	10	
6	10	
Total	65	

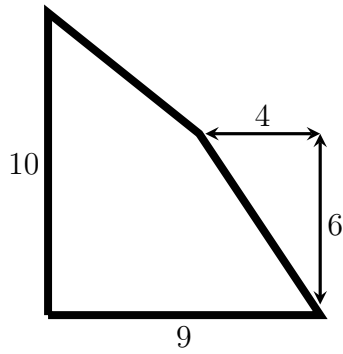
- Complete all six questions.
- Show all work for full credit.
- You may use a scientific calculator during this examination. Graphing calculators are not allowed. Also, other electronic devices are not allowed, and should be turned off and put away for the duration of the exam.
- If you use a trial-and-error 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 2 hours and 50 minutes to complete the exam.

1. Ron is swimming across the Circular Lake, which has the shape of a perfect circle with radius 5 km.

He begins at the northernmost point, and starts swimming toward a point 3 km west and 3 km south of the center of the lake. When he reaches the point on this course where he is closest to the center of the lake, he changes direction and swims due south until reaching the edge of the lake.

For what distance does Ron swim?

2. You are working with a piece of sheet steel shaped as shown below. All dimensions are in centimeters (cm).



You are going to cut the steel with a vertical cut parallel to the left edge.

If the cut is a distance of x cm from the left edge, express the area of the steel to the left of the cut as a multipart function of x ?

3. The temperature at your house in the desert is a sinusoidal function of time with a 24 hour period. The maximum daily temperature is 45 degrees Celsius and occurs at 5:00 PM. The minimum daily temperature is 11 degrees Celsius.

(a) Let t be hours after midnight last night. Find the function $f(t)$ that gives the temperature at time t .

(b) For how much of each day is the temperature above 35 degrees Celsius?

(c) Starting from midnight last night, how long will it be until the temperature has been above 35 degrees Celsius for 22 hours?

4. Olga and Pasha are running around a circular track. They start running at the same time. Pasha starts from the westernmost point of the track and runs counterclockwise. Pasha takes 95 seconds to run one lap of the track. Olga runs clockwise and passes Pasha for the first time after 11 seconds. Olga runs at a speed of 3 meters per second and takes 80 seconds to run one lap of the track.

Impose a coordinate system with the origin at the center of the track.

- (a) What are Olga's coordinates when she passes Pasha for the first time?

- (b) What are Olga's coordinates when she passes Pasha for the second time?

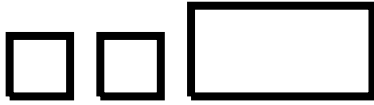
5. The population of the city of Blorg doubles every 22 years. Blorg's population was 10,000 in the year 1965. The city of Gurf's population was twice the population of Blorg in 1970. In the year 2024, the population of Gurf and the population of Blorg will be equal.

Assume that Gurf's population is growing exponentially.

When will Gurf's population be 90,000? Give your answer in years after 1965.

6. You have 720 meters of fencing with which to make three enclosures. Two will be identical squares, and one will be a rectangle which is twice as long as it is wide.

For instance, the enclosures might look like this:



- (a) What should the dimensions of the squares be to minimize the combined area of all enclosures? Note: dimensions of zero are allowed.

- (b) What should the dimensions of the squares be to maximize the combined area of all enclosures? Note: dimensions of zero are allowed.