

Math 120 A, B - Winter 2009
Final Exam
March 14, 2009

Name: _____

Student ID no. : _____

Signature: _____

Section: _____

1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
Total	70	

- Complete all questions.
- 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.
- Show all work for full credit.
- You have 50 minutes to complete the exam.

1. You are watching a friend climb a vertical wall. From where you are standing, some distance away from the wall, you measure the angle from the ground to your friend to be 62° . You then move to a point twice as far away from the wall and measure again: this time, the angle is 46° . In the time between the measurements, your friend climbed 8 feet higher.

How high is your friend above the ground at the time of the second measurement?

2. In a park, there is a fountain surrounded by mud in all directions. The mud forms a circle with a radius of 20 meters. A cat begins walking in a straight line from a point 30 meters south of the westernmost point of the circle of mud. The cat heads toward a point 5 meters east, and 11 meters north of the easternmost point of the circle. When the cat reaches a point due east of the center of the mud, it changes direction, and walks due east until leaving the circle mud.

If the cat walked at 1.3 meters per second, how much time did it spend walking in mud?

3. The population of Aarb and the population of Bullm are each growing exponentially. In the year 2000, Aarb's population was 5000. In the year 2005, Bullm's population was 7000. Bullm's population doubles every 17 years. In the year 2011, there will be twice as many people in Aarb as in Bullm.

When will Aarb's population hit 40000? Give your answer in years after 2000.

4. Charlie is a Tabby cat. The length of his whiskers vary sinusoidally with time. At 11 AM yesterday, they were at their longest: 6 cm. They then decreased in length, and reached their minimum length, 5 cm, at 8 PM yesterday.

For how many hours yesterday were Charlie's whiskers between 5.2 and 5.6 cm long?

5. Jerry and Tom are moving linearly at constant speeds in the xy -plane. The coordinates are given in meters (e.g., the point $(1,0)$ is 1 meter from the origin). Jerry starts from the point $(-5, 5)$ and reaches the point $(10, 0)$ after moving for 5 seconds. Tom starts at the same time as Jerry. Tom starts from the point $(0, 9)$ and reaches the point $(4, -3)$ after 4 seconds.

(a) (3 points) Express Jerry's x - and y - coordinates as parametric equations in the variable t , the time since they started moving.

(b) (3 points) Express Tom's x - and y - coordinates as parametric equations in the variable t , the time since they started moving.

(c) (4 points) Find the time t when Tom and Jerry will be closest together.

6. Maria is going for a walk. She begins by walking north for 1 km. She then turns and walks east for 2 km, then turns and walk south for 3 km. She walks at a constant 4 km/hr. Express the distance from Maria to her starting point as a multipart function of t , the time that she has been walking.

7. Let $f(x) = x + 2|x - 3|$, and $g(x) = 3x - 1$.

(a) Find all solutions to the equation $f(g(x)) = -4x$.

(b) Let $h(x) = g(\sqrt{x}) + x + 1$. Find $h^{-1}(x)$.