Math 120A - Spring 2004
Mid-Term Exam Number Two
May 20, 2004

Name: _____ Section: _____

1	10	
2	10	
3	10	
4	10	
Total	40	

- Complete all questions.
- You may use a calculator during this examination. Other calculating devices are not allowed.
- 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.
- Show all work for full credit.
- You have 50 minutes to complete the exam.

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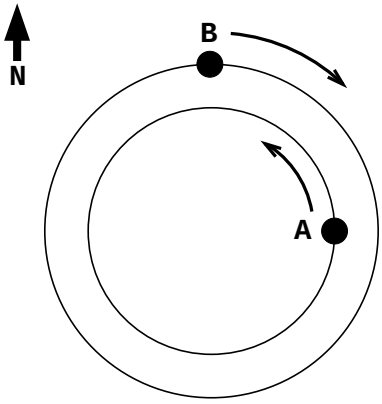
1. Suppose Tina is considering training to be a 10 kilometer(km) runner. If she trains 0 hours (i.e., if she doesn't train), she can do a 10 km run in 70 minutes. If she trains for 100 hours, she will be able to run 10 km in 60 minutes. If she trains for 300 hours, she will be able to run 10 km in 52 minutes. Suppose the time it takes her to run 10 km is a linear-to-linear rational function of the number of hours that she trains. With an unlimited amount of training, how fast could she possibly run 10 km?

2. A spacecraft landed on another planet. The atmosphere outside the spacecraft was hot, and the temperature increased until it reached a maximum of 180° C four hours after the landing. It then started to decrease, reaching a minimum of -10° C forty hours after the landing.

   Assume that the temperature is a sinusoidal function of the time since the landing.

   The astronauts can go outside of the spacecraft when the temperature is below 50° C. For how many hours during each period of the function is the temperature below 50° C?

3. Agnes and Boris are running around in circles with the same center. They start at the same time from locations as illustrated in the figure: Boris at the northernmost point of his circular path, Agnes at the easternmost point of her path. Agnes runs counter-clockwise at 10 feet per second, and her path has a radius of 200 feet. Boris runs clockwise at 9 feet per second, and his path has a radius of 240 feet.



How far apart are Agnes and Boris after they have been running for 5 minutes?

4. Find the coordinates of point P in the figure below.