Math 120A - Spring 2004
Final Exam
June 5, 2004

Name: _____   Section: _____

1	10
2	10
3	15
4	10
5	10
6	10
7	10
Total	75

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1. Let $u(t)$ be the unit step function,

$$u(t) = \begin{cases} 0 & \text{if } x < 0 \\ 1 & \text{if } 0 \leq x \leq 1 \\ 0 & \text{if } x > 1 \end{cases}$$

Write the multipart rule for the function

$$g(t) = u(2t - 2) + 2u\left(\frac{1}{3}t\right)$$

2. The cities of Abnarca and Bonipto have populations that are growing exponentially.

   In 1990, Abnarca had a population of 30,000 people. In 2000, its population was 38,000.

   Bonipto had a population of 45,000 in 1990. The population of Bonipto doubles every 35 years.

   (a) How long does it take the population of Abnarca to double?

   (b) In what year will Abnarca's population equal that of Bonipto?

3. A ship was heading at a constant speed in a northeasterly direction as shown. At midnight it reached Point A, which is 20 miles due south of Blob Point. At 3 AM, the ship reached a point due east of Blob Point.
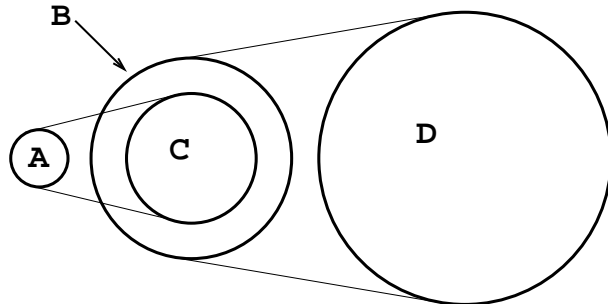
Blob Point

52°

A
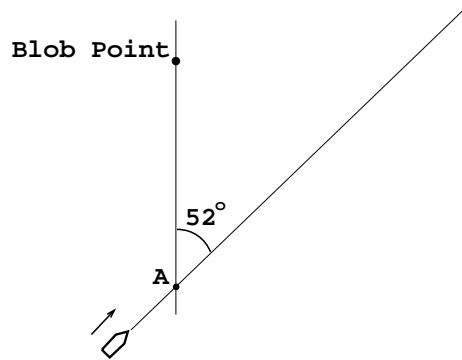
(a) How close did the ship get to Blob Point and how many hours after midnight did this occur?

(b) Let t be the number of hours after midnight. Express the distance from the ship to Blob Point as a function of t.

4. Four pulleys are attached by belts as shown. The radii of some of the pulleys are given in this table:

pulley	radius
A	1.2 cm
C	3.1 cm
D	6.5 cm

Pulley B and pulley C are attached to the same axle. If pulley A has an angular speed of 15 rad/sec, and pulley D has an angular speed of 3.9 rad/sec, what is the radius of pulley B?

5. Chandra is showing a film to raise money for a charitable organization. From previous experience, she knows that if she charges $8 per ticket, she will sell 500 tickets to the show. If she charges $11.40 per ticket, she will sell 420 tickets to the show.

If the number of tickets sold is a linear function of the price per ticket, what price should she charge in order to make the most money?

6. Renaldo starts running around a circular track which is 300 meters around (i.e., one lap of the track is 300 meters). Renaldo runs at a constant speed of 6.18 meters per second. After running for 10 minutes, how far is Renaldo, in a straight line, from his starting point?

7. The temperature in Gavin's oven is a sinusoidal function of time. Gavin sets his oven so that it has a maximum temperature of 450°F and a minimum temperature of 400°. Once the temperature hits 450°, it takes 35 minutes before it is 450° again.

   Gavin's cake needs to be in the oven for one hour at temperatures at or above 430 °. He puts the cake into the oven when it is at 425° and rising. How long will Gavin need to leave the cake in the oven?