

Math 120BDE - Autumn 2003
Mid-Term Exam Number Two
November 20, 2003

Name: _____

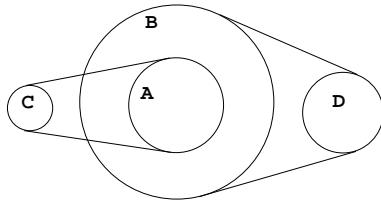
Section: _____

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. Four pulleys (A, B, C, and D) are attached by two belts as shown in the figure.



Pulleys A and B are rigidly attached to the same axle. The pulleys have radii as follows:

<u>pulley</u>	<u>radius</u>
A	0.85 cm
B	1.75 cm
C	0.4 cm
D	0.75 cm

Pulley A has an angular speed of 5 revolutions per minute.

(a) (5 points) What is the angular speed of pulley C?

(b) (5 points) What is the linear speed of a point on the belt connecting pulley B and pulley D?

2. A patient with sinusoidal fever has a temperature that is a sinusoidal function of time. At midnight, their temperature was dropping, and it kept dropping until it reached a minimum of 36°C at 1:30 AM. It then climbed, and reached a maximum of 41°C at 5 AM. The patient needs surgery, but it is only safe to operate while the patient's temperature is below 40°C . How long can the operation be?

3. Student X knows that their score on the final exam in Math 120 is a linear-to-linear function of the number of hours they study. That is, for h hours of study, student X will get a score of

$$s(h) = \frac{ah + b}{h + c}$$

for some constants a , b , and c . If they study zero hours, their score will be 35 percent. If they study 10 hours, their score will be 50 percent. The more student X studies, the closer their score will be to 100 percent, but they cannot get a score over 100 percent. How much should they study to get a score of 74 percent?

4. From your viewpoint, a vertically rising plume of smoke makes an angle of 54° with the horizontal. You decide to put more distance between yourself and the plume, and move 100 meters farther away. You measure the angle of view again and find it to be 48° , but the plume has grown 20 meters taller in the time between your measurements. How tall is the plume?