

Math 120 D and E - Autumn 2005  
Exam 2  
November 17, 2005

Name: \_\_\_\_\_

Section: \_\_\_\_\_

Student ID Number: \_\_\_\_\_

TA's Name: \_\_\_\_\_

1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

- You are allowed to use a calculator and one **hand-written** 8.5 by 11 inch page of notes.
- Check that your exam contains all the problems listed above.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit.
- Write your answers in the specified locations. Unless otherwise indicated, you must round your **final answer** to two digits after the decimal.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- Raise your hand if you have a question.
- Put your name on your sheet of notes and turn it in with the exam.
- Any student found engaging in academic misconduct will receive a score of 0 on this exam.
- You have 50 minutes to complete the exam.

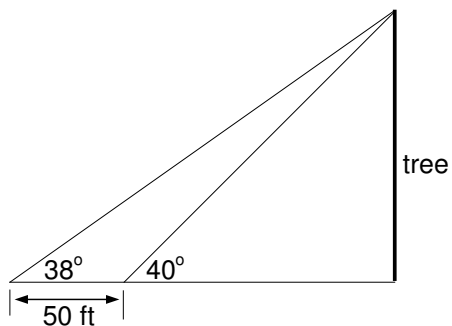
GOOD LUCK!

1. (10 points) The fans of the local Mudville baseball team only seem to care about homeruns. When the team hits 50 homeruns in a season, the attendance is 6 million fans. When the team hits 100 homeruns in a season, the attendance is 13 million fans. The more homeruns the team hits, the closer and closer the attendance gets to the capacity of 20 million fans.

(a) Find the linear-to-linear model that gives attendance as a function of homeruns.

(b) Using your model, how many homeruns does the team have to hit to get exactly 18 million fans to attend?

2. (10 points) You are standing in a clearing at a certain distance from the base of a tall tree. You observe that the top of the tree makes an angle of  $40^\circ$  above the level ground at your current location. You move back 50 feet and observe that the top of the tree makes an angle of  $38^\circ$  above the level ground at the new location. This situation is illustrated below.



Find the height of the tree to the nearest foot.

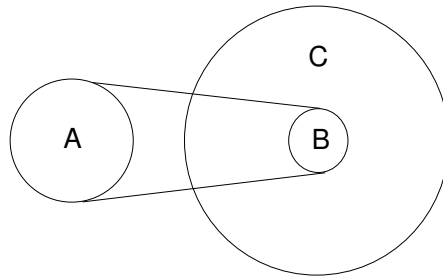
3. (10 points) Let  $u(t)$  be the unit step function,

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

Write the multipart rule for the function

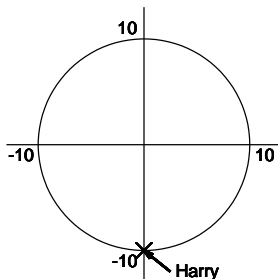
$$g(t) = u(2t - 3) + (t + 1) u\left(\frac{1}{2}t - 1\right)$$

4. (10 points) You are riding a bicycle along a level road. Assume each wheel is 15 inches in radius and the front sprocket has radius 8 inches. The front sprocket,  $A$ , the rear sprocket  $B$ , and the rear wheel,  $C$ , are shown below.



If the front sprocket has angular speed of 200 revolutions per minute and the speed of the bike is 40 miles per hour, what is the radius of the rear sprocket?

5. (10 points) Harry is standing on the far southern outer edge of a merry-go-round of radius 10 feet. The merry-go-round is rotating counterclockwise with an angular speed of 15 revolutions per minute. Below we give a figure of this situation and we impose a coordinate system with the origin at the center of the merry-go-round.



Give the  $(x, y)$  coordinates of Harry after 2 seconds.