

MATH 120D  
Exam 1  
Version 1  
October 24, 2002

Name \_\_\_\_\_

Section \_\_\_\_\_

1	10	
2	10	
3	12	
4	10	
5	8	
Total	50	

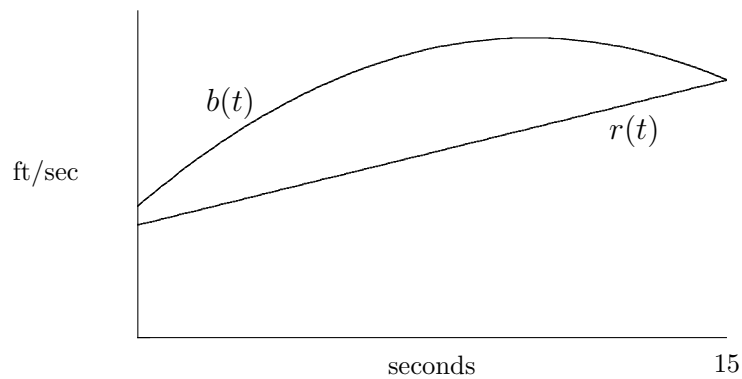
- You are allowed to use a calculator and one sheet of notes.
- Complete all questions.
- Show all your work and clearly indicate your final answer.
- When rounding is necessary, round your **final answer** to two digits after the decimal.
- Give answers with appropriate units.
- Raise your hand if you have a question.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (10 points) Two bicyclists, one on a blue bicycle and one on a red bicycle, travel in the same direction on a straight road. They pass a tree at the side of the road at exactly the same instant. The blue bicycle's speed  $t$  seconds after passing the tree is given by the quadratic function

$$b(t) = -.18t^2 + 3.6t + 14.$$

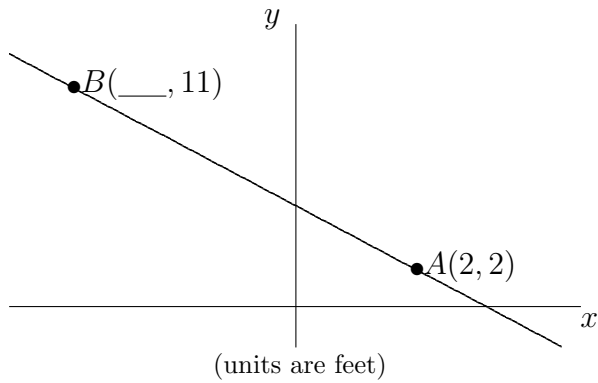
The red bicycle's speed is given by a linear function. As they pass the tree, the red bicycle travels 12 feet per second; fifteen seconds later, the two bicycles have the same speed. The graph of each bicycle's **speed** is shown below.



- (a) Compute  $r(5)$ , the red bicycle's speed 5 seconds after passing the tree.
- (b) Find the time during these 15 seconds at which the difference between the speed of the bicycles is the greatest.

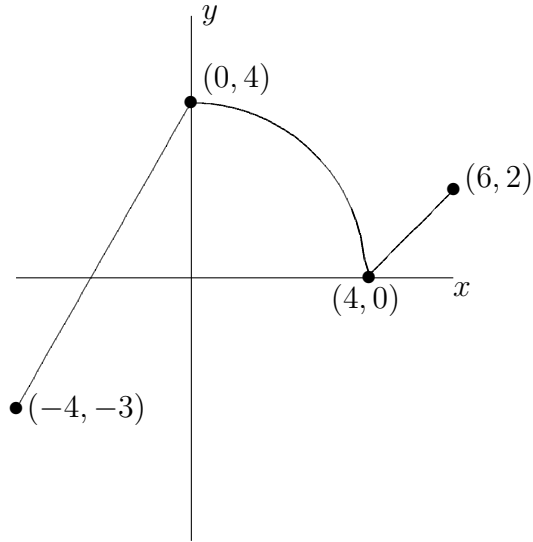
2. (10 points) An ant walks from point  $A$  to point  $B$  along a straight-line path given by the equation

$$3x + 2y = 10.$$



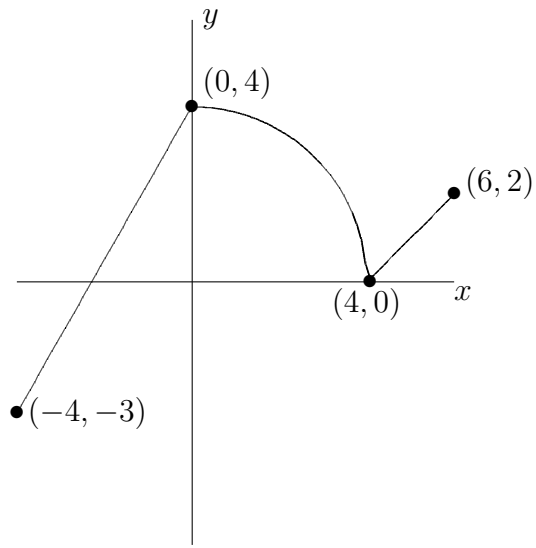
- (a) If the ant walks at a rate of 1.6 feet per second, compute how much time it takes for the ant to get from point  $A$  to point  $B$ .
- (b) Suppose there is a circular puddle of milk, centered at the origin, with radius 10. Give the  $x$ -coordinate of the point where the ant exits the puddle.

3. (12 points) The graph of a multi-part function  $f(x)$  is shown below. The graph is made of line segments and one quarter of a circle.



- (a) Give the multi-part rule that defines  $f(x)$ .
- (b) What is the domain of the function  $g(x) = \sqrt{f(x)}$ ?

(c) Again, here is the graph of  $f(x)$ .



Sketch the graph of  $h(x) = f(\frac{1}{2}x) + 3$ . Clearly label at least four points on your graph.

4. (10 points) Let  $f(x) = 3x^2 - 5x + 2$ .

(a) Assume  $h \neq 0$  and compute

$$\frac{f(x+h) - f(x)}{h}.$$

Simplify as much as possible.

(b) Assume  $a \neq 0$  and compute

$$\frac{f(2a) - f(a)}{a}.$$

Simplify as much as possible.

5. (8 points) Let  $f(x) = x + 2$  and  $g(x) = |x|$ .

(a) True or False? (circle one)

**T**      **F**       $f(f(x)) = f(x)$  for all values of  $x$ .

**T**      **F**       $g(g(x)) = g(x)$  for all values of  $x$ .

(b) Recall the multi-part rule for the absolute value function:

$$g(x) = |x| = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$$

Write out the multi-part rules for:

i.  $f(g(x))$

ii.  $g(f(x))$