

**MATH 111 D**  
Exam I  
Hints and Answers

1. (3 points each)
  - (a) HINT: Compute the slope of the secant line through the distance graph at  $t = 10$  and  $t = 70$ .  
ANSWER: approximately 0.43 mpm
  - (b) HINT: Draw a diagonal line with slope 1.6 and see where it intersects the distance graph.  
ANSWER:  $t = 24$  (approximately)
  - (c) HINT: Use the line with slope 1.6 that you drew in part (b) and slide your ruler parallel to that line until you've got a five-minute interval.  
ANSWER:  $t = 85$  minutes (approximately)
  - (d) ANSWER: approximately 0.67 mpm
  - (e) HINT: Mark the point on the distance graph at  $t = 15$ . Draw a line from that point with slope  $\frac{2}{3}$  (i.e. go over 3 and up 2). Find the two places where this line intersects the distance graph. These occur at about  $t = 38$  and  $t = 97$ . That means that the slope of the secant line from 15 to 38 is  $\frac{2}{3}$  and the slope of the secant from 15 to 97 is  $\frac{2}{3}$ . So, 38 and 97 are values of  $15 + h$ . You want values of  $h$ .  
ANSWERS:  $h = 23$  and  $h = 82$  (approximately)
2. (3 points each)
  - (a) HINT:  $VC(2)$  is approximately 30 dollars. Since  $FC = \$120$ , this means that  $TC(2)$  is approximately 150 dollars.  
ANSWERS:  $AVC(2) = 15$  dollars per thing;  $AC(2) = 75$  dollars per thing
  - (b) HINT: Compute the slope of the secant line through  $TR$  from  $q = 7$  to  $q = 8$ . (Note: Since the quantity is measured in single Things, the slope of the tangent line at  $q = 7$  is an approximation of the  $MR$ , but isn't the best thing to use here.)  
ANSWER: approximately 15 dollars
  - (c) HINT: Find the largest vertical gap between  $TR$  and  $VC$  and subtract your fixed costs.  
ANSWER: approximately 185 dollars
  - (d) HINT:  $AR$  is the slope of a diagonal through  $TR$  and  $AVC$  is the slope of a diagonal through  $VC$ . You need to find a line that is a diagonal through BOTH graphs. This will happen only at the place where the two graphs intersect.  
ANSWER:  $q = 10$
3. (a) (3 points) HINT: The temperature doesn't change from  $t = 2$  to  $t = 4$ . (The change in temp graph shows a  $\Delta T$  of 0 at  $t = 2$ .) So, it's not graph (i). The change in temp from  $t = 4$  to  $t = 6$  ( $\Delta T = 1$ ) is smaller than the change in temp from  $t = 6$  to  $t = 8$  ( $\Delta T = 1.5$ ).  
ANSWER: (iii)
  - (b) (5 points) T; T; F; F; T
  - (c) (3 points) HINT: Add the changes over the intervals that start at  $t = 12$  (noon) and 14 (2 p.m.):  $-1.1 - 1.9$ .  
ANSWER: -3 degrees
4. (4 points each)
  - (a) ANSWERS:  $q = 2$  and  $q = 11$
  - (b) ANSWER:  $x = \frac{8}{3}$ ,  $y = 9$
  - (c) ANSWER:  $x = \frac{4}{R-5}$