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 $t = 30$ and $t = 80$.
   ANSWER: approximately 0.25 mpm

   (b) HINT: Draw a diagonal line with slope 0.8 and see where it intersects the distance graph.
   ANSWER: $t = 57$ or $t = 93$ minutes (approximately)

   (c) HINT: Use the line with slope 0.8 that you drew in part (b) and slide your ruler parallel to that line until you've got a five-minute interval.
   ANSWER: $t = 75$ 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 $\frac{1}{3}$ (i.e. go over 3 and up 1). Find the two places where this line intersects the distance graph. These occur at about $t = 58$ and $t = 77$. That means that the slope of the secant line from 15 to 58 is $\frac{1}{3}$ and the slope of the secant from 15 to 77 is $\frac{1}{3}$. So, 58 and 77 are values of $15 + h$. You want values of h.
   ANSWERS: $h = 43$ and $h = 62$ (approximately)

2. (3 points each)

   (a) HINT: $VC(7)$ is approximately 245 dollars. Since $FC = \$70$, this means that $TC(7)$ is approximately 315 dollars.
   ANSWERS: $AVC(7) = 35$ dollars per thing; $AC(7) = 45$ dollars per thing

   (b) HINT: Compute the slope of the secant line through TR from $q = 3$ to $q = 4$. (Note: Since the quantity is measured in single Things, the slope of the tangent line at $q = 3$ is an approximation of the MR, but isn't the best thing to use here.)
   ANSWER: approximately 28 dollars

   (c) HINT: Find the largest vertical gap between TR and VC and subtract your fixed costs.
   ANSWER: approximately 240 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 ΔT of 0 at $t = 2$.) So, it's not graph (iii). 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: (i)

   (b) (5 points) F; F; T; T; T

   (c) (3 points) HINT: Add the changes over the intervals that start at $t = 4$, 6, 8, and 10: $1 + 1.5 + 1.9 + 2$.
   ANSWER: 6.4 degrees

4. (4 points each)

   (a) ANSWERS: $q = 7$ and $q = 10$

   (b) ANSWER: $x = \frac{4}{5}$, $y = 7$

   (c) ANSWER: $x = \frac{1}{R-2}$