Math 120 A Spring 2011
Mid-Term Exam Number One
April 21, 2011
Answers

There were two versions of the exam.

Version A - In problem 1, Vera starts from a point 120 feet due north of the water main.

1. (a) $x = 10t$, $y = 120 - 2t$ (b) Solve the equation $(12t)^2 = (10t)^2 + (120 - 2t)^2$ for t. The one positive solution is 13.899748 seconds.

2. (a) Let $M(t)$ be the amount of money Helga makes if she works t hours. Then

$$M(t) = \begin{cases} 10t & \text{if } 0 \leq t \leq 8, \\ 80 + 15(t - 8) & \text{if } 8 \leq t \leq 12, \\ 140 + 20(t - 12) & \text{if } 12 \leq t. \end{cases}$$

   (b) 11.4285 hours.

3. 8.19288 km

4. The maximum possible area is 625 cm^2.

Version B - In problem 1, Vera starts from a point 100 feet due south of the water main.

1. (a) $x = 15t$, $y = -100 + 2t$ (b) Solve the equation $(14t)^2 = (15t)^2 + (-100 + 2t)^2$ for t. Since this equation has no real solutions, Vera's feet never get wet.

2. (a) Ket $M(t)$ be the amount of money Helga makes if she works t hours. Then

$$M(t) = \begin{cases} 9t & \text{if } 0 \leq t \leq 8, \\ 72 + 13.5(t - 8) & \text{if } 8 \leq t \leq 12, \\ 126 + 18(t - 12) & \text{if } t > 12. \end{cases}$$

   (b) 10.2857 hours

3. 8.94427 km

4. The maximum possible area is 6400 cm^2.