Math 120 A, B - Winter 2007
Mid-Term Exam Number One
Answers
January 25, 2007

There were two versions. In problem 1, the radius of the green was 15 feet in version A, and 20 feet in version B.

1. Part (a) requires finding the equation of the line through the balls starting point and the hole. This is a slightly easier version of problem 4.8 part (a) from the assigned homework. Part (b) requires finding the equation of the line perpendicular to the line you found in part (a), then finding the intersection of those two lines, and finally finding the distance from this point to Mario. This is the same as 4.8 part (d) from the assigned homework.

   Answer:

   Version A: (a) 8.3205 feet west, 12.4808 feet south; (b) 2.7735 feet

   Version B: (a) 7.4278 feet west, 18.5695 feet south; (b) 3.8996 feet

2. If x is the height and y is the width of the enclosure, then the area is

$$A = xy$$

   and the cost to make the enclosure is $r_1(2x + 2y) + r_2(2x) = 1000$ where r_1 and r_2 are the cost per foot of the fencing and the partitions, respectively. Using this equation, solve for y in terms of x and plug into $A = xy$ to get A expressed as a quadratic function of x. Find the vertex, and answer the question.

   This is extremely similar to problem 7.12 from the assigned homework, and is solved using the same methods.

   Answer:

   Version A: Height is 40.9836 feet, width is 104.1667 feet. Version B: Height is 90.9091 feet, width is 384.6154 feet.

3. In part (a), one way to find the rules for the parts of the function is to determined the equations of the circles parts of which make up the graph of the function. Then, solve for y in terms of x, and choose the appropriate choice of $+$ or $-$.

   This part is just like problem 6.10 in the assigned homework.

   In part (b), from the graph we can see that only one solution is possible, so only one equation needs to be solved. This is similar to problem 6.3 of the assigned homework, though here there is only one equation to solve.

   Answer:

   Version A:

   (a)

$$f(x) = \begin{cases} \frac{2}{5}x & \text{if } 0 \le x \le 5 \\ 4 - \sqrt{4 - (x-5)^2} & \text{if } 5 \le x \le 7 \\ 4 + \sqrt{9 - (x-10)^2} & \text{if } 7 \le x \le 10. \end{cases}$$

(b) $10 - \sqrt{8}$

Version B: (a)

$$f(x) = \begin{cases} \frac{2}{5}x & \text{if } 0 \le x \le 5 \\ 4 - \sqrt{4 - (x-5)^2} & \text{if } 5 \le x \le 7 \\ 4 + \sqrt{9 - (x-10)^2} & \text{if } 7 \le x \le 10. \end{cases}$$

(b) $10 - \sqrt{8}$

4. You need to find two linear functions, one for the goats and one for the kangaroos. Call them $G(t)$ and $K(t)$. You then need to solve the equation

$$G(t) = 2K(t)$$

and then use t to answer the question.

This **is** problem 4.6 from the assigned homework, with different numbers.

Answers:

Version A: 74 years since your first visit.

Version B: 39.1667 years since your first visit.