Mathematics 122

Quiz 18 Name: Key

You must show your work to get full credit.

1.

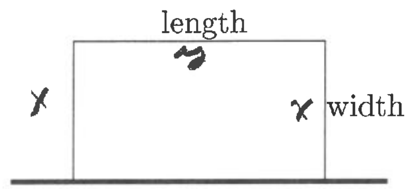

FIGURE 1. A pen against the side of a barn. The length is parallel to the side of the barn and the width is perpendicular to the barn.

A farmer wishes to build pen against the side of a barn as pictured. He has 100 feet of fencing. What length and width will maximize the area of the pen?

length = 50 width = 25

Let x = width y = length

Then $2x+y = 100$ (total length of fence)

The area is

$$A = xy = x(100-2x) \qquad (y = 100-2x)$$
$$= 100x - 2x^2$$

The critical point is when

$$\frac{dA}{dx} = 100 - 4x = 0$$
so $x = \frac{100}{4} = 25$

is maximizer

Then $y = 100 - 2(x) = 100 - 50 = 50$

2. Let $g(x) = xe^{-x}$. Find the derivative of g and its critical points.

$g'(t) =$ $e^{-x}(1-x)$ The critical point(s) are $x = 1$

$$g'(x) = x'e^{-x} + x(e^{-x})' = e^{-x} - xe^{-x} = e^{-x}(1-x)$$

$e^{-x}(1-x) = 0$ implies $x = 1$. So $x = 1$

is only critical point