Worksheet 19

15 March 2016

1. **Warm up:** Answer the following questions with "True" or "False," justifying your choice.

   (a) If the radius of a circle is increasing, its area is increasing at the same rate.

   (b) The rate of change of distance between two moving cars does not depend on where they started out.

   (c) If the only term with a y in an equation is $5yx^2$, then the equation is not a function.

2. A rectangle has its lower left corner at $(0,0)$ and its upper right corner on the circle of radius 2 centered at $(0,0)$, with base length x, as in the picture below.
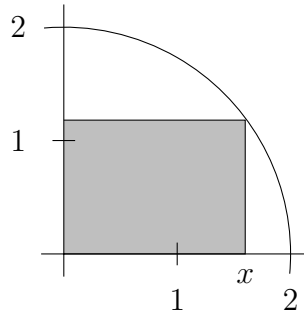

   Find x between 0 and 2 that maximizes the area of the rectangle.

3. A rectangular piece of paper is 12 inches high and 6 inches wide. The lower right-hand corner is folded over to reach the left edge of the paper, as in the picture to the right.

   What is the smallest possible length for the crease?
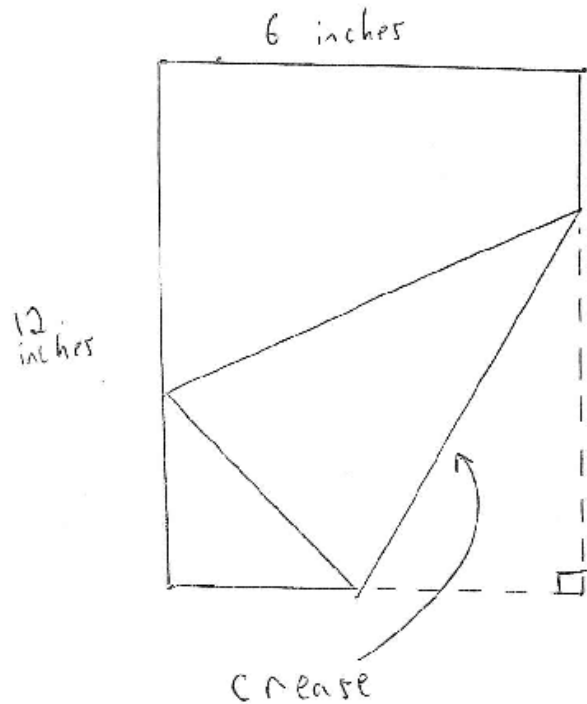
4. Two triangular pens are built against a barn. Two hundred meters of fencing are to be used for the three sides and the diagonal dividing fence as in the picture.
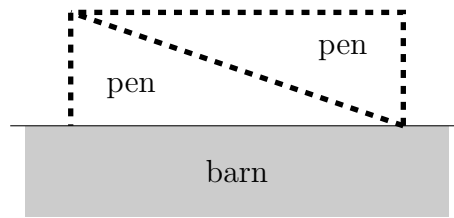
What dimensions of the pens maximize the area of the pens?

5. How many maxima and minima do each of the functions have on the given interval? Find the coordinates (x, y) where these extrema occur.

(a) $y = x^2$ on $(-\infty, \infty)$

(d) $y = \sin(x)$ on $[0, 4\pi)$

(b) $y = x(x - 5)(x + 5)$ on $[-6, 6]$

(e) $y = e^x$ on $[-100, 100]$

(c) $y = \tan(x)$ on $[-\pi/2, \pi/2]$

(f) $y = \arctan(x)$ on $(0, \infty)$