Math 1110: **Applied Optimization Problems** Nov 7 (Wed)

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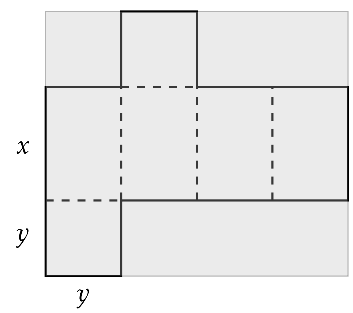
Steps for solving optimization problems:

(1) Draw a picture.
(2) Assign variables and label them in your picture.
(3) Come up with an expression for the quantity you want to optimize, in terms of your variables.
(4) Eliminate all except one variable in the expression you obtained in Step 3.
(5) Use the given information to come up with an appropriate interval for the remaining variable.
(6) Find the global maximum or maximum of the quantity you want to optimize, over the interval you obtained in Step 5.

1. At the southernmost tip of a certain peninsula, the coastline follows the shape of the graph $y = x^2$ (where the southernmost tip is $(0, 0)$). You are swimming at the point $(3, 0)$. Which point on the coastline are you closest to?

2. **Minimizing Cardboard**
   Small boxes are sometimes made by folding cardboard shape like this one.



   In our case, we want build a box of $1\mathrm{m}^3$. If we cut this shape out of a rectangular piece of cardboard (the grey-shaded area), what dimensions of the box will minimize the total area of the piece of cardboard?

3. You aim to take the best possible picture of the Statue of Liberty from the ground (no helicopters, that's cheating). But you don't care much for the pedestal it sits on, so you want to maximize the angle between the top of the statue, your camera, and the foot of the statue (i.e., the top of the pedestal). How far from the base of the pedestal should you stand?

   (We assume that both the pedestal and statue are h m high, where $h \approx 45$.)