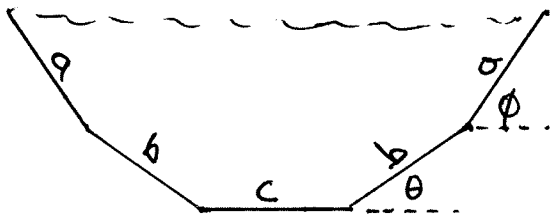
# ECE523 Optimization HW

A drainage channel is needed to prevent flooding. The goal is to minimize the amount of concrete needed to form the channel sides while maximizing the volume it contains. A cross section of the drainage channel is shown below.

To minimize concrete use, let $2a+2b+c=1$
where $a \geq 0$, $b \geq 0$, $c \geq 0$. In addition $0 \leq \theta \leq 90^\circ$
$0 \leq \phi \leq 90^\circ$




Find the optimum values for $a, b, c, \theta, \phi$.

Clearly document how you construct the objective function to be minimized.

Clearly document how you include variable constraints.

Solve this problem using two algorithms:

i) fminsearch in MATLAB

ii) your own algorithm, clearly documented.

Compare the performance of the two algorithms,
Which requires the most iterations?
Which is more accurate for the same error criteria?

Let the initial conditions be

$a = 0.05$, $b = 0.2$, $c = 0.5$, $\theta = \phi = 30^\circ$

Describe what you learned from doing this work.

Can you get any algorithm to converge if you let all initial conditions be equal to zero?