your name(s)_____

Physics 841 Project - Due Monday, March 13

You may work in groups of two, turning in one project for the two of you. You should turn in a print-out of your program and a plot. This can be done via email.

Consider a two-dimensional world where you consider the electric potential within the boundary,

$$0 < x < 1000, \quad 0 < y < 200.$$

The boundaries of the region are kept at potentials,

$$
\begin{aligned}
\Phi(x, y = 0) &= 0, \\
\Phi(x, y = 200) &= V_{\text{max}}, \\
\Phi(x = 0, y) &= \Phi(x = 1000, y) = \frac{y}{200} V_{\text{max}}.
\end{aligned}
$$

The potential can be considered as coming from a thunderstorm with the ground being at ground. Now, add a thin lightning rod at $x = 500$, with a height of 100. The rod can be considered as being at zero potential.

Write a program to numerically solve for the potential $\Phi(x, y)$. Plot the potential as a contour plot in two dimensions. A python plotting routine is provided on the course web site. To use it you must write your data to a file in the form:

$\Phi(x = 0, y = 0)$	$\Phi(x = dx, y = 0)$	$\Phi(x = 2dx, y = 0)$	$\Phi(x = 3dx, y = 0)$	$\cdots$
$\Phi(x = 0, y = dy)$	$\Phi(x = dx, y = dy)$	$\Phi(x = 2dx, y = dy)$	$\Phi(x = 3dx, y = dy)$	$\cdots$
$\Phi(x = 0, y = 2dy)$	$\Phi(x = dx, y = 2dy)$	$\Phi(x = 2dx, y = 2dy)$	$\Phi(x = 3dx, y = 2dy)$	$\cdots$
$\cdots$	$\cdots$	$\cdots$	$\cdots$	$\cdots$