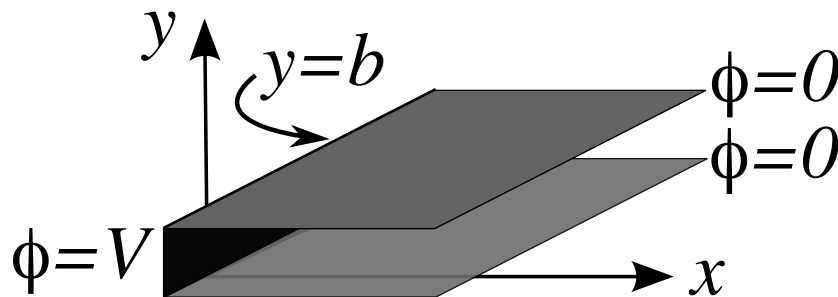


# PHYS4210 Electromagnetic Theory Spring 2009

Posted Problem for Homework Due Thursday 5 Feb 2009

Two semi-infinite, grounded, conducting planes lie parallel to the  $xz$  plane. They are separated in the  $y$  direction by a distance  $b$ , and their edges lie against the plane  $x = 0$ .



An infinitely long conducting strip with width  $b$  lies in the  $x = 0$  plane between the two grounded planes, and is held at a constant electric potential  $V$ .

Solve Laplace's Equation for the electric potential  $\phi(\mathbf{r})$  between the two grounded planes, for  $x \geq 0$ , subject to the boundary conditions described above. Impose the further condition that  $\phi \rightarrow 0$  as  $x \rightarrow +\infty$ . Your solution will be in terms of a Fourier series.

Demonstrate that the boundary condition at  $x = 0$  is satisfied by making a plot of your solution for  $\phi/V$  as a function of  $y$  at  $x = 0$ . Do this by showing what the result looks like for the sum of the first several nonzero terms of the Fourier series.