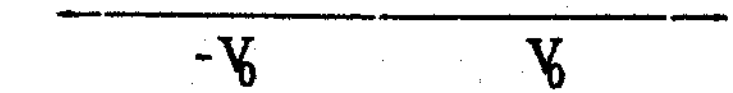
9. *Electricity and Magnetism*

Consider the infinite two-dimensional conducting plane depicted in the figure. The right half is maintained at electrostatic potential V_0 while the left half is maintained at potential $-V_0$. What is the potential above the plane?



$\phi(r, \theta = 0) = V_0$

$\phi(r, \theta = \pi) = -V_0$

$\phi(r,\theta) = [a_0 + b_0 \ln r][c_0 + d_0 \theta]$

$\phi(r,\theta) = [a r^{\alpha} + b r^{-\alpha}][C \cos\alpha\theta + D \sin\alpha\theta]$

for $\alpha > 0$

$\alpha = 0$, is appropriate since the angular spread is less than 2π

(morales Lec notes page 1201)

$\phi(0) = V_0 = [a_0 + b_0 \ln r][c_0]$ $\quad V_0 = a_0 c_0 \quad c_0 = 0$

$\phi(\pi) = -V_0 = [a_0][c_0 + d_0\pi] = a_0 c_0 + a_0 d_0 \pi$

$= V_0 + a_0 d_0 \pi = -V$

$a_0 d_0 \pi = -2V$

$a_0 d_0 = \frac{-2V}{\pi}$

$\phi(r,\theta) = a_0 c_0 + a_0 d_0 \theta$

$= V_0 - \frac{2V\theta}{\pi}$