

# PHY 741 – Assignment #16

NAWH – October 24, 2003

1. Consider an electron (mass  $m$ , charge  $-e$ ) constrained to move along the  $x$ -axis near a metal surface, which due to image charging effects provides a potential of the form

$$V(x) = \begin{cases} \infty & \text{for } x \leq 0 \\ -\frac{e^2}{2x} & \text{for } x > 0 \end{cases} \quad (1)$$

Show how the eigenstates and eigenvalues of the one-dimensional Hamiltonian

$$\mathcal{H} = \frac{p_x^2}{2m} + V(x) \quad (2)$$

can be related to those of the three-dimensional Hydrogen atom.