PHY-851 QUANTUM MECHANICS I
Midterm test
October 26, 2001
Total 30 points

NAME...

PROBLEM 1 /10/. *Do particles fall on the Earth?*
An electron is moving in the gravitational field of the Earth. Consider the Earth
as an impenetrable flat surface. Estimate the mean height of the electron above
the ground for the lowest quantum mechanical state. (Give the number.)

PROBLEM 2 /20/. The potential consists of an infinitely high wall at $x = 0$
and a narrow well $-g\delta(x - a)$; g and a are positive constants.

a. Find the bound states of the particle of mass m in this potential and depen-
dence of a number of such states on the parameters of the problem.

b. For the scattering problem with the same potential find the solution that
has the form $\sin(kx + \alpha)$ at distances $x > a$ and determine the phase shift α as
a function of energy.