1.(20 pts.) Imagine a tunnel drilled through the center of the earth. A ball is dropped into the whole at the surface of the earth. This simple experimental situation is obviously not realizable for any number of practical reasons such as distance, temperature, pressures etc. However, answer the following questions estimating any values you need such as the radius or mass of the earth or gravitational constant.

a) Write down the equation of motion for the ball with gravity as the only force (no friction).
b) Solve the equation of motion and describe the motion of the ball.
c) What is the round trip transit time of the ball? (a number with units)
d) What is the maximum velocity of the ball in m/sec?
e) What is the approximate speed of sound at the earth's surface in m/sec (to one significant digit)
f) If the ball is electrically charged and the earth is considered to be a dielectric, will there be electromagnetic radiation resulting from the motion of the ball? If you think there is radiation, how will this qualitatively affect the motion of the ball?