89.456 - APPLIED GEOPHYSICS
PROBLEM SET - GROUND PENETRATING RADAR

1. A water saturated sandstone has a relative dielectric constant of 6 and a conductivity of 2.5×10^{-3} S m^{-1}. The radar you are using radiates at a frequency of 500 MHz.

   a. Calculate the velocity of the radiowaves in the saturated sandstone.

   b. Calculate the depth at which the intensity of the radar beam is reduced to 10% of its initial intensity. The equation is $E_x/E_o = \exp(-\alpha x)$.]

2. Consider a typical sandy aquifer. The water table is located at a depth of 2m. For dry sand $\varepsilon_r = 4$ and for water saturated sand $\varepsilon_r = 30$. Calculate the amplitude reflection coefficient. Will the water table be distinguishable by GPR? Explain.

3. Calculate the vertical resolution for a 500 MHz antenna in water-saturated sandstone (use the velocity calculated in Problem 1).