MIT OpenCourseWare

12.510 Introduction to Seismology
Spring 2008

Problem Set 2 (Due on Wed., April 9, 2008)

Please don't just copy the results from books: show full derivations!

1. For (i) S_H wave incidence on the solid-solid interface and (ii) P wave incidence on the free surface:

   (a) Give the potentials, boundary conditions, Zoeppritz' equations and all the elements of the scattering matrix. (20 points)

   (b) In some cases an angle exists where the reflection coefficient is zero; the angle for which that happens is called the intramission angle: compute – for the wavespeeds given – the intramission angle. (10 points)

   (c) Make plots of reflection and transmission coefficients as function of incidence angle (from $i = 0°$ through $i = i_c$ to $i = 90°$). (10 points)

   (d) Explain the plots. (10 points)

SH incidence ($\rho_1 = 2.5g \cdot cm^{-3}$ $\rho_2 = 3g \cdot cm^{-3}$ $\beta_1 = 3km \cdot s^{-1}$ $\beta_2 = 4km \cdot s^{-1}$)

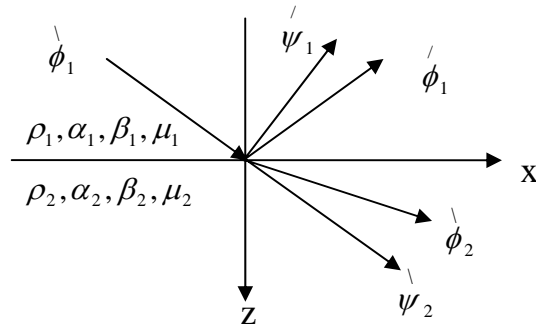**P incidence** ($\alpha = 5.5km \cdot s^{-1}$ $\beta = 3.2km \cdot s^{-1}$)
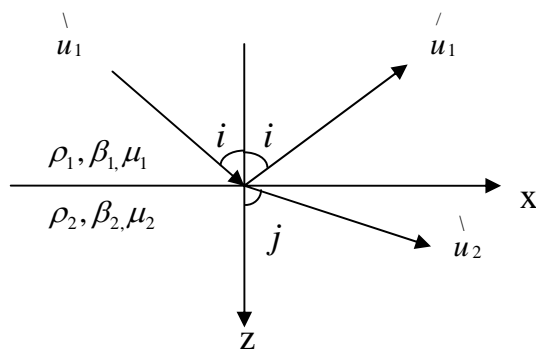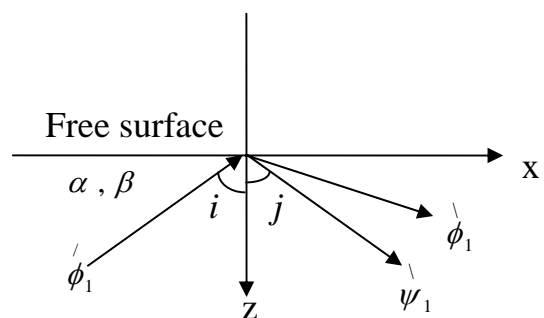
SH incidence   *P incidence*

2. Give the Zoeppritz' equations of the P-S_V system (P incidence) across a solid-solid interface. (20 points)

P-S_V system (P incidence)

3. Suppose we have an incidence plane wave S_H as depicted in Figure below: prove that the total response has the same amplitude as that of the incidence wave. (30 points)