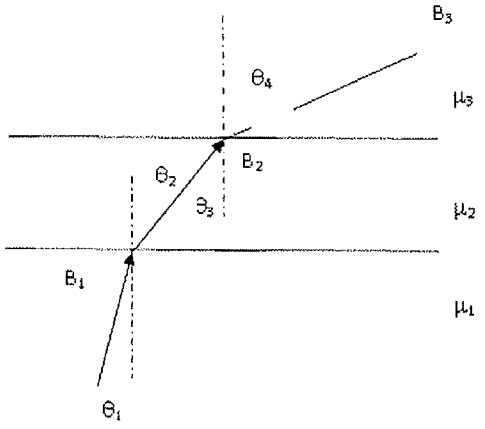
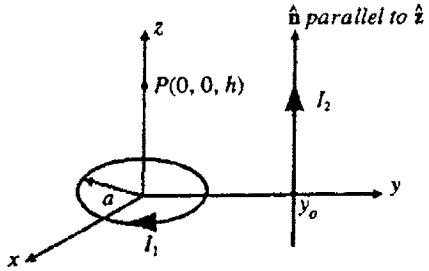
(1) Show that if no surface current densities exist at the parallel interfaces shown in below figure, the relationship between θ_4 and θ_1 is independent of μ_2. B_1, B_2, B_3, μ_1, μ_2, μ_3 are the magnetic flux density and permeability for each medium, respectively. The dash lines (normal directions to the interfaces) are in parallel. (1.0 point);



(2) A circular loop of radius a carrying current I_1 is located in the x-y plane as shown in the figure. In addition, an infinitely long wire carrying current I_2 in a direction parallel with the z-axis is located at $y = y_0$. Determine magnetic field H at point P (0, 0, h) (1.0 point)



(3) The circuit shown below consists of a 100 Ω transmission line terminated in a load with $Z_L = (50 + j\ 100)\ \Omega$. V_g and R_g are the generator voltage source and impedance and no specific values are needed for the following questions. Assume the 100 Ω T-line is lossless. If the peak value of the load voltage was measured to be 12 V, determine:

a. The time-average power dissipated in the load; (1.0 point)
b. The time-average power incident on the line; (0.5 point)
c. The time-average power reflected by the load; (0.5 point)