EOS/PHYS 427 — Assignment 8

Due: Tuesday, April 4, 2023

1. (a) Compute the root depth of a 6000-m high mountain with an average density of 2700 kg/m^3 in Airy isostatic equilibrium with an underlying substratum of density 3300 kg/m^3. (5 pts)

   (b) For a compensation depth equal to the base of the continental crust (35 km), continental crust density of 2700 kg/m^3, oceanic crust density of 3000 kg/m^3, and water density of 1000 kg/m^3, compute the ocean depth assuming Pratt isostatic equilibrium. (5 pts)

2. (a) Show that the geoid height anomaly for an ocean basin in Airy isostatic equilibrium is given by (15 pts)

$$\Delta h = -\frac{\pi G d}{g}(\rho_u - \rho_w)\left[2t - d\left(\frac{\rho_s - \rho_w}{\rho_s - \rho_u}\right)\right].$$

   (b) Evaluate the geoid height anomaly for a 5-km deep ocean given a compensation depth at the base of the crust ($t = 35$ km) with $\rho_u = 2800$ kg/m^3, $\rho_s = 3300$ kg/m^3, and $\rho_w = 1000$ kg/m^3. (5 pts)

3. (a) Show that the geoid height anomaly for an ocean basin in Pratt isostatic equilibrium is given by (15 pts)

$$\Delta h = -\frac{\pi G d t}{g}(\rho_u - \rho_w).$$

   (b) Evaluate the geoid height anomaly for a 5-km deep ocean assuming a compensation depth at the base of the lithosphere ($t = 100$ km) using densities given in 2(b). (5 pts)