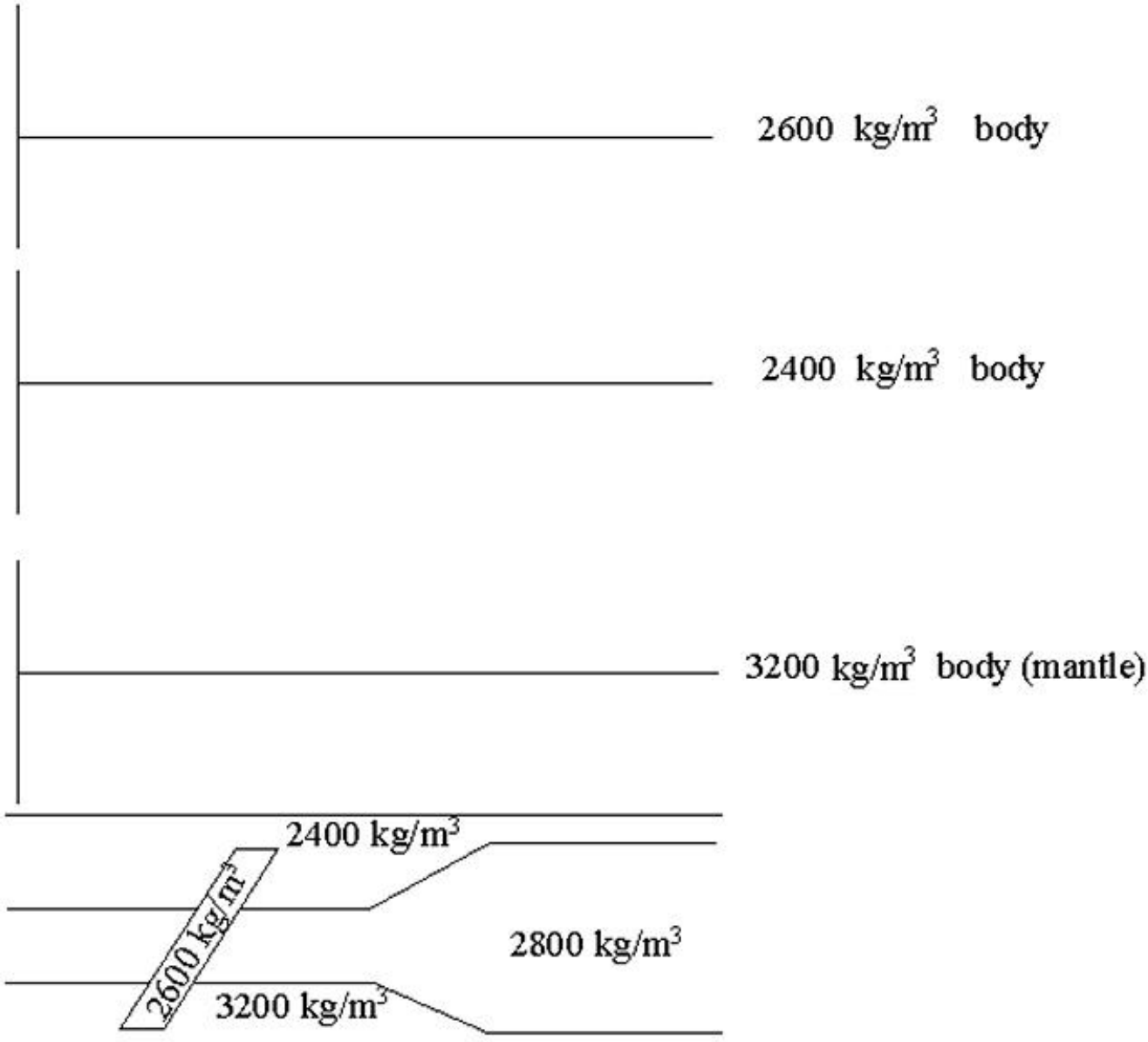
Spring 2002, GEOL 438 midterm Who?_____

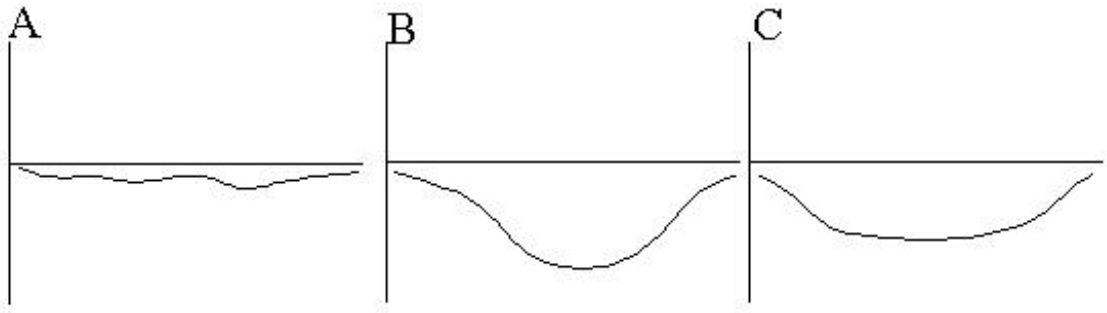
1a. For each case below, sketch ( think about relative amplitudes and gradients) the expected Bouguer anomaly. You can imagine them as separate cases but you need to consider the differences among densities. Explain your thinking with a few short notes and/or comments.




1b. If you were prospecting for things like the dike, what would the regional from the above cross section look like (explain what regional means and add a sketch).

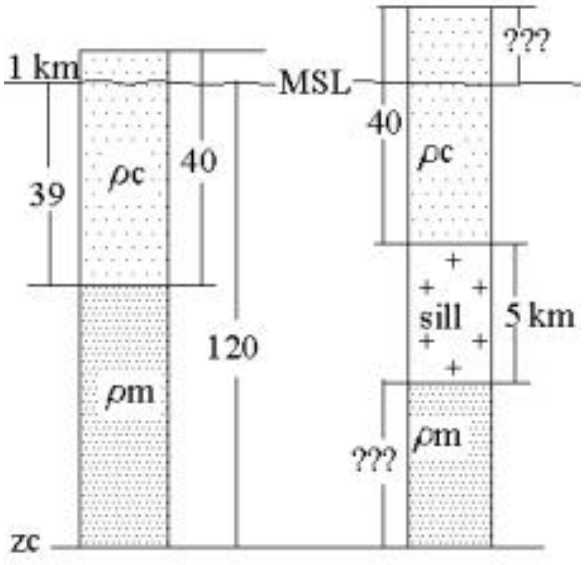
2. The three Bouguer profiles below are over wide (500 km+) mountain belts with roughly the same character of topography. That is, the mountains reach the same heights and the ranges are comparable in width. WHAT can you say, and WHY, about the relative strength of the lithosphere and the style of isostatic compensation for each case?

**Remember the vertical axis is Bouguer gravity**




3. Suppose you determined the mass and moment of a new planet. Explain, as if you are trying to teach a journalist something, what determinations you could make about the gross structure of the planet and how you would do so.

4. a. Let's say the average elevation of a broad region is 1 kilometer, the crust is 40 kilometers thick, the average crustal density is 2800 kg/m$^3$, mantle density is 3250 kg/m$^3$, and the depth of compensation is at 120 kilometers. Now, imagine igneous processes from adjacent subduction add a 5 kilometer thick granitic sill, 2700 kg/m$^3$, in the mid crust. Assume 100% Airy compensation and calculate the new average elevation.




4 b. How much of the crust do you have to erode to get the surface back down to sea level?

5. I showed that the deflection of lithosphere due to the loading of topography is:

$$w(x)=\frac{ho}{\left[\frac{pm}{pc}-1+\frac{D}{pc\cdot g}\cdot\left(\frac{2\cdot\pi}{\lambda}\right)^4\right]}\cdot\sin\left(\frac{2\cdot\pi\cdot x}{\lambda}\right)$$ where: $$D=\frac{E\cdot h^3}{12\cdot\left(1-v^2\right)}$$

a. Explain (define) the variables and constants: ho, pm, pc, D, g, E, h, v, and $\lambda$ - mention their geophysical context.

b. Assume a thrust sheet impinges on the crust in two steps. After the first movement of the thrust system the rocks rest for a while and then another thrust sheet is brought in beneath the first one, each stage contributes to the foreland basin. Think about the equation (or a similar one of your choosing) carefully explain what you could learn after measuring the angle of the resulting angular unconformity. How do you expect the angular unconformity to change with distance from the load?