Outline of Lecture 6 (4-11-02)

I) Overview of oceanic plate thickness, contraction and density change with age and distance to Mid-Ocean Ridge (MoR).
   1) How does oceanic lithosphere, D, compare to the thermal boundary layer, $\delta$? Why are they not the same physical thing?
   2) How does plate spreading rate relate to lithospheric thickness away from a MoR?
   3) What about the effects of thermal contraction with age?
      A) How does this effect density (relationship between mantle density, $\rho_M$, and lithospheric density, $\rho_L$)?
      B) How does the mean lithospheric density change with time? Or does it?
      C) What is the common misconception about cause for subduction of oceanic lithosphere?
      D) What is the approximate pressure difference between a 100 Ma old oceanic lithosphere and the same thickness of mantle material? What does this tell you? How does this qualitatively compare to the stress drop ($\Delta\sigma$) of a moderately large earthquake?

II) Oceanic Lithosphere depth using isostasy
   1) Basic definition of isostasy (we will discuss it in more detail in the future)
   2) How does plate age affect sea floor topography (bathymetry)?
      A) Need to consider an isostatic balance where the lithostatic pressure is constant at an arbitrary depth beneath lithospheric changes.
      B) What is the relative relationship between sea floor depth with time, $d_t$?
      C) Using real world values, what are the values of relative sea floor depth change with age?
   3) What is the mean sea floor depth, $z$ (this is the same as $z$ with a line over it in class)?
      A) Need to use the mean-value theorem from calculus
      B) What average values are approximate for the mean MoR depth, $d_0$?
      C) What about the $1/2$ spreading rate, $u_{1/2}$?
      D) How does the calculated mean sea floor depth correspond to actual (figure in class).
   4) Why does the sea floor seem to first go deeper away from the MoR and then, in many places, actually appear to get shallower with age?

III) Summary of age/temperature controls on Oceanic lithosphere; knowing age (or distance from MoR and spreading rate) we can find the thickness of:
   A) Oceanic thermal boundary layer, $\delta$
   B) Oceanic lithosphere, D
   C) Lithospheric thermal contraction, h
   D) Relative depth to MoR of sea floor. d