1) Consider the following scenario: We are following an air parcel from San Francisco westward over the Cascade mountains into Colorado.

a) Use the provided section with distance on the x axis and height on the y axis. The height of the mountain chain in the middle of the graph is 3000 m. Indicate on the graph at various points the air temperature and dew point temperature of the air parcel. The conditions at ground level in San Francisco are 18°C with a dew point of 8°C.

b) At which height will clouds form (use round number lapse rates)?

c) What are the weather conditions, temperature and dew point at the peak of the mountain?

d) What is the temperature and dew point temperature at sea level downwind of the mountain. Is the relative humidity higher or lower compared to San Francisco (don't compute relative humidity exactly just discuss?)
2) You are given a plot of the two components of the top-of-the-atmosphere energy (heat) flux as a function of latitude on the same graph. Label each curve with numbers and units.

a) Do the two curves have identical values at each latitude?

b) If not, what are the implications of the differences for the Earth's climate?

c) What atmospheric phenomena exist as a result?
3) You are given the mean winter surface pressure distribution over the North Atlantic Sector. Make sure that you locate a and mark a High and a Low pressure system over the islands that they were named after.

a) Label the given pressure contours with their rough magnitude (units?).

b) Sketch the balance of forces that result in surface winds (neglect friction) for the High and the Low pressure system.

c) If we now consider friction at the surface where do we expect rainfall to occur and why?

d) The High on your graph is part of a well known large scale circulation cell. What is its name? Give a brief description and sketch of its circulation in the height latitude plane.