Request from the Grader:

Please print your name clearly on the upper right-hand corner of the first page, and staple the pages together.

1. On a day when the environmental lapse rate is 7°C/km, the air at the ground is found to have a relative humidity of 100% and a temperature of 15°C. If a parcel of air rises from the ground to a height of 1 km, will it be able to rise further on its own?

2. In Fig. 7.26 on p. 186, the temperatures on the left side are the environmental temperatures for the air at each level, so that the ELR is 8°C/km, and the air is conditionally unstable.

Suppose that the wind is blowing from the west and a parcel of surface air with a temperature of 10°C and a dew point temperature of 2°C begins to rise upward along the western (windward) side of the mountain.

   a. What is the height of the LCL? What are the temperature and dew point temperature of the air at that level?

   b. What is the temperature of the rising air parcel at an altitude of 3000m? Use the approximate MALR given in class, 6°C/km.

   c. What is the LFC for this parcel?

3. In the previous problem, suppose the parcel goes over the top of the mountain at 3000m and then descends back to 0m. On its way up the mountain, the parcel loses water mass due to precipitation, so it is unsaturated during its descent.

What is the temperature of the parcel at 0m on the leeward side of the mountain?

4. Explain why adding some ice nuclei to a cold cloud will increase precipitation, but adding an enormous number of nuclei (say, one ice nucleus for every supercooled cloud droplet) could prevent precipitation from occurring at all.

Note: homework is due at the beginning of class on the due date. Please explain your answers and show all work.