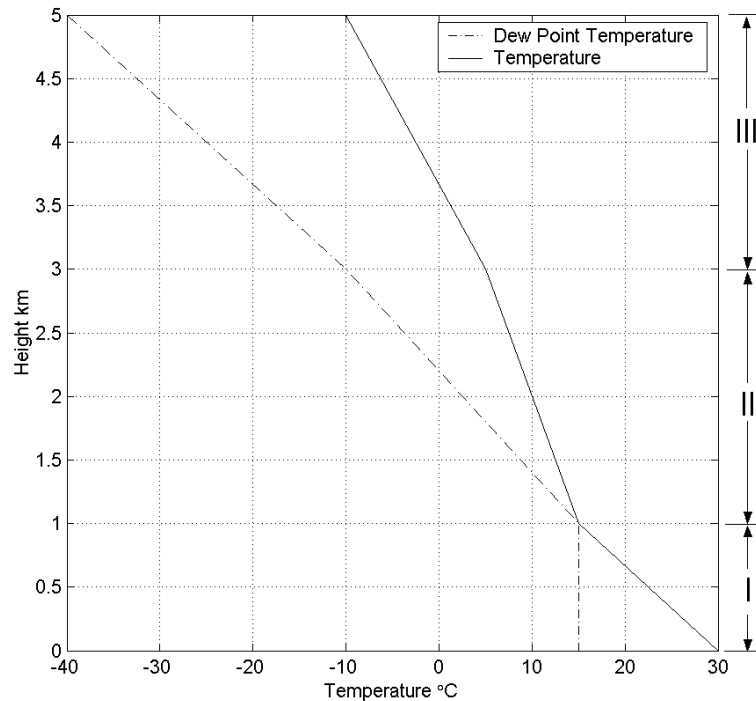Name: _____ Section/TA: _____

Atmospheric Sciences 101, Spring 2003
Homework #5–Due the <u>beginning</u> of section Thu/Fri, 15/16 May 2003

1. Using the above sounding answer the following questions:

a. Classify the layers indicated on the sounding as being absolutely stable, conditionally unstable, or absolutely unstable. Include what factor(s) led you to this conclusion for each layer.

Layer I:

Layer II:

Layer III:

b. Circle the correct choice in the questions below:

The relative humidity <u>increases / decreases</u> moving from 0 km to 1 km.

The relative humidity <u>increases / decreases</u> moving from 1 km to 3 km.

c. At what height would the relative humidity be 100%? How did you conclude this?

2. Actual vapor pressure is a measure of the actual water vapor content of the air whereas relative humidity (RH) is a measure of how close to saturation an air parcel is.

    How would you expect the following variables to change if:

a. Amount of water vapor in the air increased at a constant temperature

    Relative Humidity   ↑ **inc**   ↓ **dec**   **remain the same**
    Actual Vapor Pressure   ↑ **inc**   ↓ **dec**   **remain the same**
    Dew Point Temperature   ↑ **inc**   ↓ **dec**   **remain the same**


    Air temperature increases without additional evaporation

    Relative Humidity   ↑ **inc**   ↓ **dec**   **remain the same**
    Actual Vapor Pressure   ↑ **inc**   ↓ **dec**   **remain the same**
    Dew Point Temperature   ↑ **inc**   ↓ **dec**   **remain the same**

b. Under what conditions would you find a high relative humidity in a region of low vapor pressure?

c. If the air is cooled to its dew point temperature what is the RH?

3. Imagine an air parcel moving up and over a mountain. As the parcel is lifted it cools until it is saturated (**B**) at which time precipitation begins. By the time the parcel reaches the top of the mountain it has lost all its moisture.
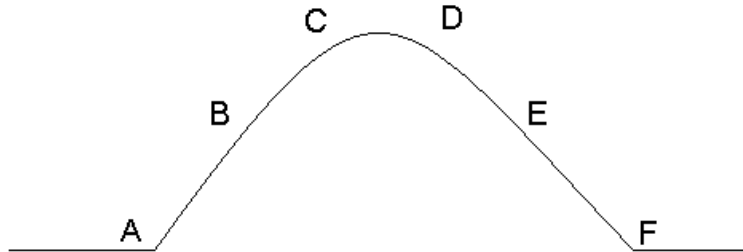

a. Between points B and C the parcel is **cooling / warming** at the **moist / dry** adiabatic rate. (circle the correct words)

Between points D and E the parcel is **cooling / warming** at the **moist / dry** adiabatic rate. (circle the correct words)

b. Assuming the temperatures at points A and E are the same, which has a higher relative humidity? Why?

c. Points A and F are at the same elevation, which location has a higher temperature? How do you know this?

d. Why are areas of subsidence generally dry?

e. The equatorial regions receive the most incoming solar radiation, yet climatically we see the highest temperatures in the subtropics. Why? (Hint: Think about the Hadley Circulation.)

4. Use the sounding below to answer the following questions. The plot shows the environmental temperature versus height.
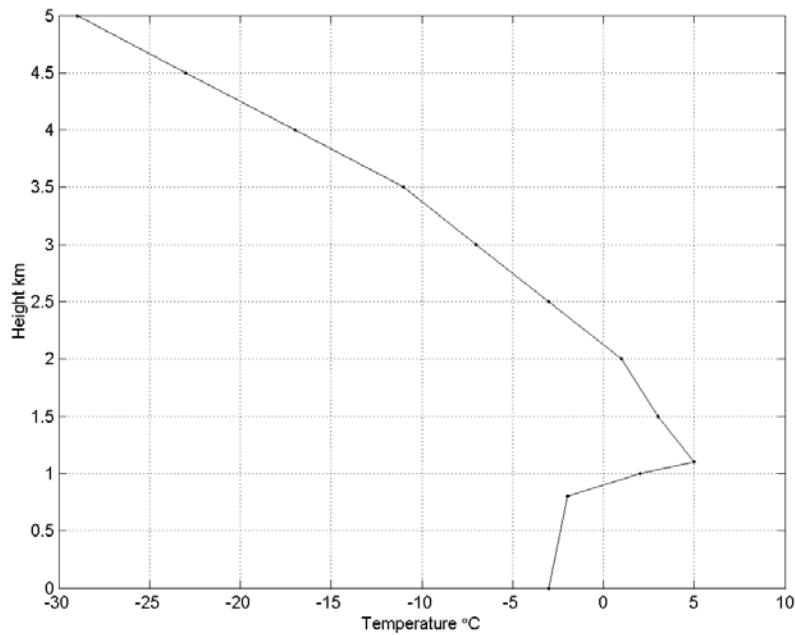
a. There are clouds above the station. The base(or bottom) of the clouds is at 2.5 km. What type of precipitation is most likely falling <u>from the cloud base</u>? Why?

b. What type of precipitation is most likely <u>occurring at the surface</u> (0 km)? Why?

c. Stratus clouds are normally associated with precipitation in the form of drizzle. Why don't stratus clouds form larger rain drops, as can be found in precipitating cumulus clouds?

5. Be sure to continue entering your forecasts for the forecasting contest! You must make at least 14 forecasts to receive credit for the competition, see the course website for details.