The Len Lesser Memorial Assignment

- Use engineering paper.
- Use SI units unless otherwise directed.
- Draw a box around your final result.
- Use usual meteorological notation and proper notation for vectors.
- Write/draw neatly.
- Always simplify/factor as much as possible.
- Refer to the “problem solving” hints attached for a guide to answering questions.
- Questions? See me in office hours, or send questions via email to bridger@met.sjsu.edu.

1. CAR Q X-3. At a time when the temperature is 15°C and the pressure is 1000 mb, the vapor pressure is found to be 8.522 mb
   a. What is the relative humidity?
   b. What is the mixing ratio w? What is the saturation mixing ratio w_s?
   c. Compare the value of r = w/w_s with your result from (a) and COMMENT.
   d. Compute w and w_s from the approximate formula w ≈ e/p.
   e. What is the specific humidity μ? What is the saturation specific humidity μ_s?
      use your “w” values from (b) here.
   f. Compare the value of r = μ/μ_s with your result from (a) and COMMENT.
   g. Would you say that e/p is a better approximation of μ than it is of w?
   h. How much water vapor and how much dry air is actually present in a 1 kg parcel of moist air under the given conditions?
   i. Find the virtual temperature and the specific volume of the moist air.

2. Tsonis Q (7.12)
   a. Outside air has temperature -15°C and relative humidity RH = 60%. If air indoors has temperature 25°C, what is the RH inside the room? (3.6%)
   b. If the room has a volume of 100 m³, how much water vapor must be supplied so that the RH rises to 50%, and what will the total mixing ratio be then? (1.08 kg, 8.97 g/kg)
   c. If the temperature change due to evaporating water is neglected, what amount of heat must be added for this humidification to happen? Assume ε_v = 2.5x10^6 J/kg is constant. (2.7x10^6 J)

3. Consider Arizona in summer, when you could easily have very dry air with a temperature of 40°C. Estimate the wet bulb temperature for these conditions, i.e., estimate the lowest temperature to which air could be cooled by evaporation.

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1 Jerry Seinfeld’s “Uncle Leo”!