ATSC 201 **Midterm Exam** Name: _____
Prof. Stull (open books, notes, calculator)
Fall 2011 (50 points ≈ 1 minute/point) Student Number: _____

1. (7 points) An air parcel at P = 85 kPa has temperature T =10°C and dew-point T_d = –5°C. Plot this point on the attached Skew-T diagram, and then use that diagram to answer the following questions:

   a) r = _____ g/kg. b) r_s = _____ g/kg c) the air parcel is **saturated** or **unsaturated** (circle one)

   d) LCL = _____ kPa e) θ = _____ °C

   f) If the air parcel rises to a height where P = 50 kPa, its new T = _____ °C

   g) Suppose that precipitation falls through the original air parcel at its original height (assume the air parcel remains stationary). If some of the precipitation evaporates into the air parcel, draw arrows attached to your original points on the thermo diagram to show in which direction(s) the thermodynamic state of the parcel changes.

2. (6 pts). a) Plot the following wind data on the attached hodograph:

z (km)	0	1	2	3	4	5	6
Direction (°)	60	110	140	160	180	200	220
Speed (m/s)	5	7	10	15	20	25	35

   Use this hodograph to answer the following:
   b) At z = 5 km, use graphical methods to find U ≈ _____ m/s and V ≈ _____ m/s.
   c) Using graphical methods, <u>normal</u> thunderstorm movement has
   direction ≈ _____° at speed ≈ _____ m/s
   d) If this storm splits into **right moving** and **left moving** storms, which one will dominate (circle your answer in this sentence)?

3. (1 pts) The 0 to 3 km storm relative helicity for the previous wind data is 145 m^2/s^2.
   If a thunderstorm forms and creates a tornado, the likely tornado strength is EF_____ .

4. (4 pts) Explain the role of the lid or cap, and how thunderstorms can be triggered. (very short answer)

5. (4 pts) What causes downbursts to form? (very short answer)

6. (1 pts) If T = 20°C and T_{wet} = 10°C, then relative humidity RH = _____ %

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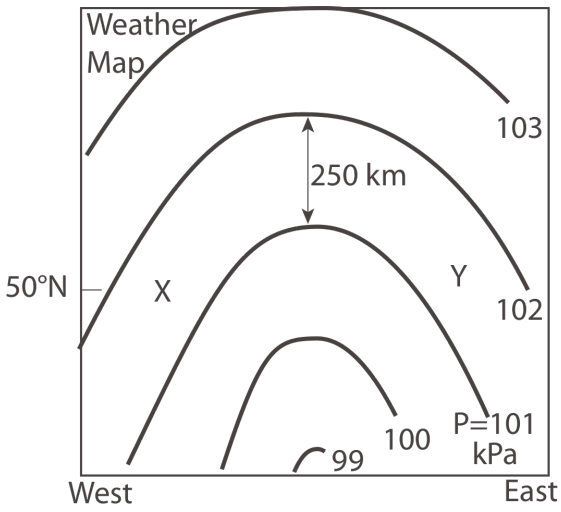
7. (9 pts) Given a layer of air between the pressure levels of P_1 = 90 kPa and P_2 = 70 kPa, where the average conditions in that layer are T = 10°C and r = 8 g/kg ? The layer thickness Δz = _____ km.

(state which equations you use, and show your work here)

8. (7 pts) Use the weather map below.
   a) determine the geostrophic wind speed at X on the map. G = _____ m/s
   b) draw an arrow at X on the map representing the geostrophic wind direction (and label it "G").
   c) draw an arrow at X showing the direction of Coriolis force for the geostrophic wind (and label it "C").
   d) draw an arrow at Y on the map representing the wind direction near the ground (and label it "D").



9. (9 pts) Given an initial relative vorticity of $\zeta_R = 2\text{x}10^{-5}\ s^{-1}$ in a 2 km thick layer of air at 50° latitude. If that air moves to 40° latitude, then its new relative vorticity is ζ_R = _____ s^{-1}.

(state which equations you use, and show your work here)

10. (2 pts) 03 UTC on Friday corresponds to _____ PST (Pacific Std. Time) on _____ .

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