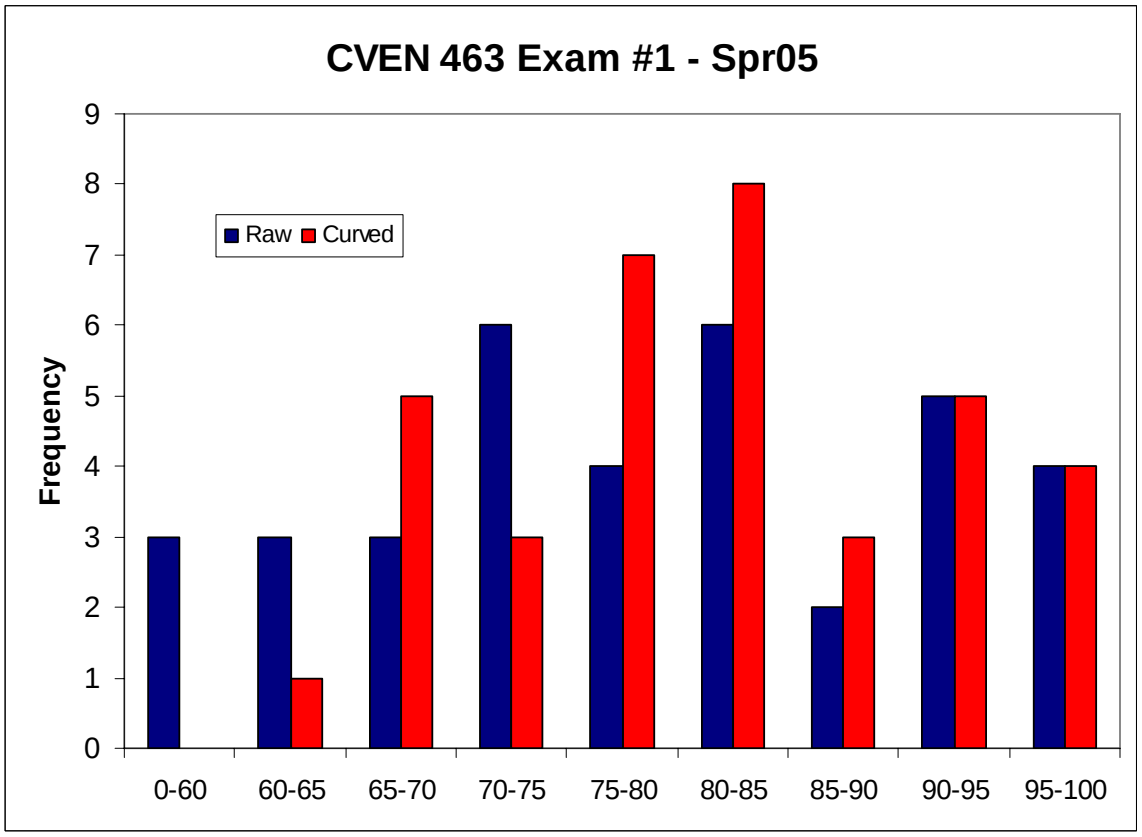
CVEN 463 – Spring 2005 – Midterm Exam #1

Grade Statistics (36 students)

	Raw	*Curved*
Median	79	81.0
Mean	79.0	81.7
St. Dev.	12.3	9.7
Maximum	97	97.0
Minimum	56.5	64.5



Name: _____

CVEN 463 –Engineering Hydrology
Spring Semester 2005
Dr. Kelly Brumbelow, Texas A&M University

Exam #1

Closed-book, Closed-notes (2 pages, 3 questions in this section, max. 20 minutes)

Complete this section, and submit it to the proctor who will give you the Open-Book section

1. Give complete and intelligible definitions for the following (3 points each):
   a) Vapor pressure

   b) Saturated mixing ratio

   c) Recording gage

2. Why do soils with high clay content "hold" water better than sandy soils? (8 points)

3. Draw the major global air circulation cells and the surface winds caused by the Greenhouse and Coriolis Effects on the globe below. The lines of latitude shown are at 30^{o} intervals from the equator to the poles. (8 points)

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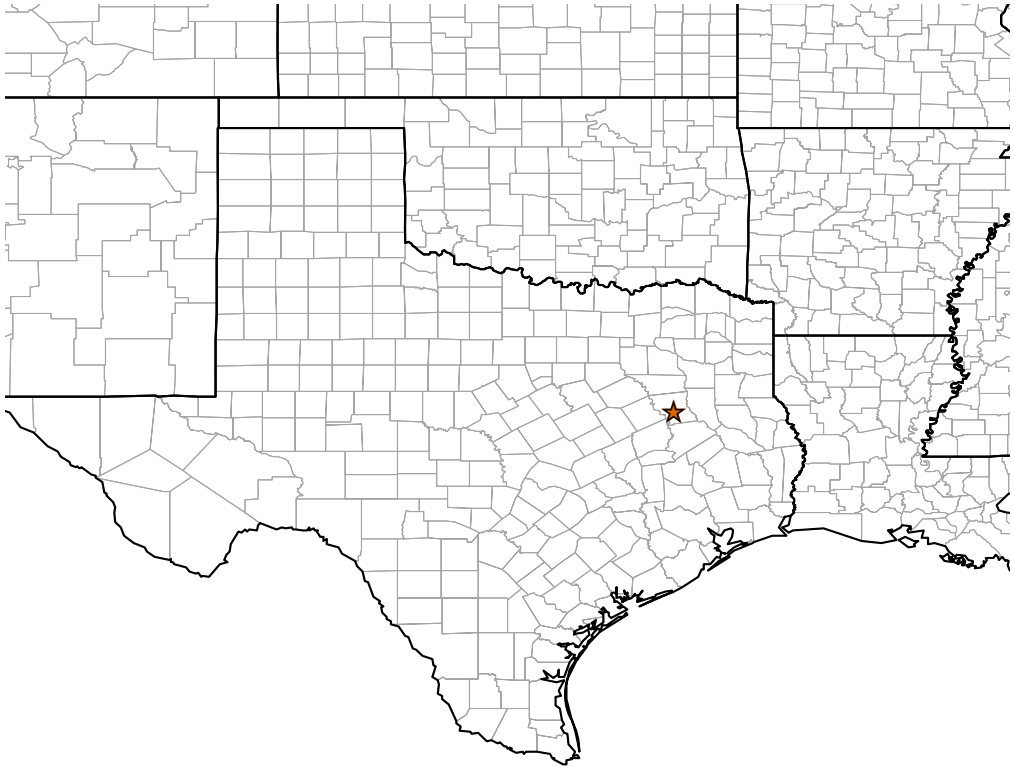
Exam #1

Open-book, Open-notes (5 pages, 3 questions in this section, time allowed is rest of class after submission of closed-book section)

{A pseudo-adiabatic diagram is attached as the final page.}

1. Using the HYDRO-35 maps and formulae, *determine the rainfall total occurring in the 45-minute, 50-year storm at Palestine, Texas*. The location of Palestine within Texas is indicated below. (25 points)



2. *Which of these two parcels of air could <u>not</u> exist in the Earth's atmosphere? Explain your answer.*
(15 points)

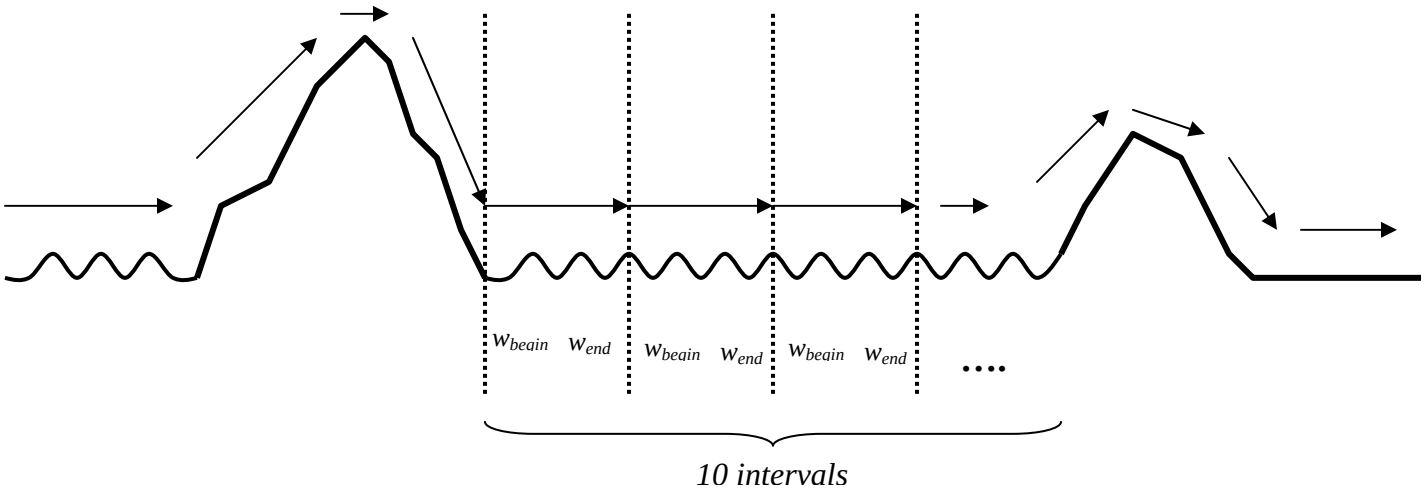
a – Parcel air pressure 850 mb, temperature 13º C, mixing ratio 5.2 $^{g}/_{kg}$

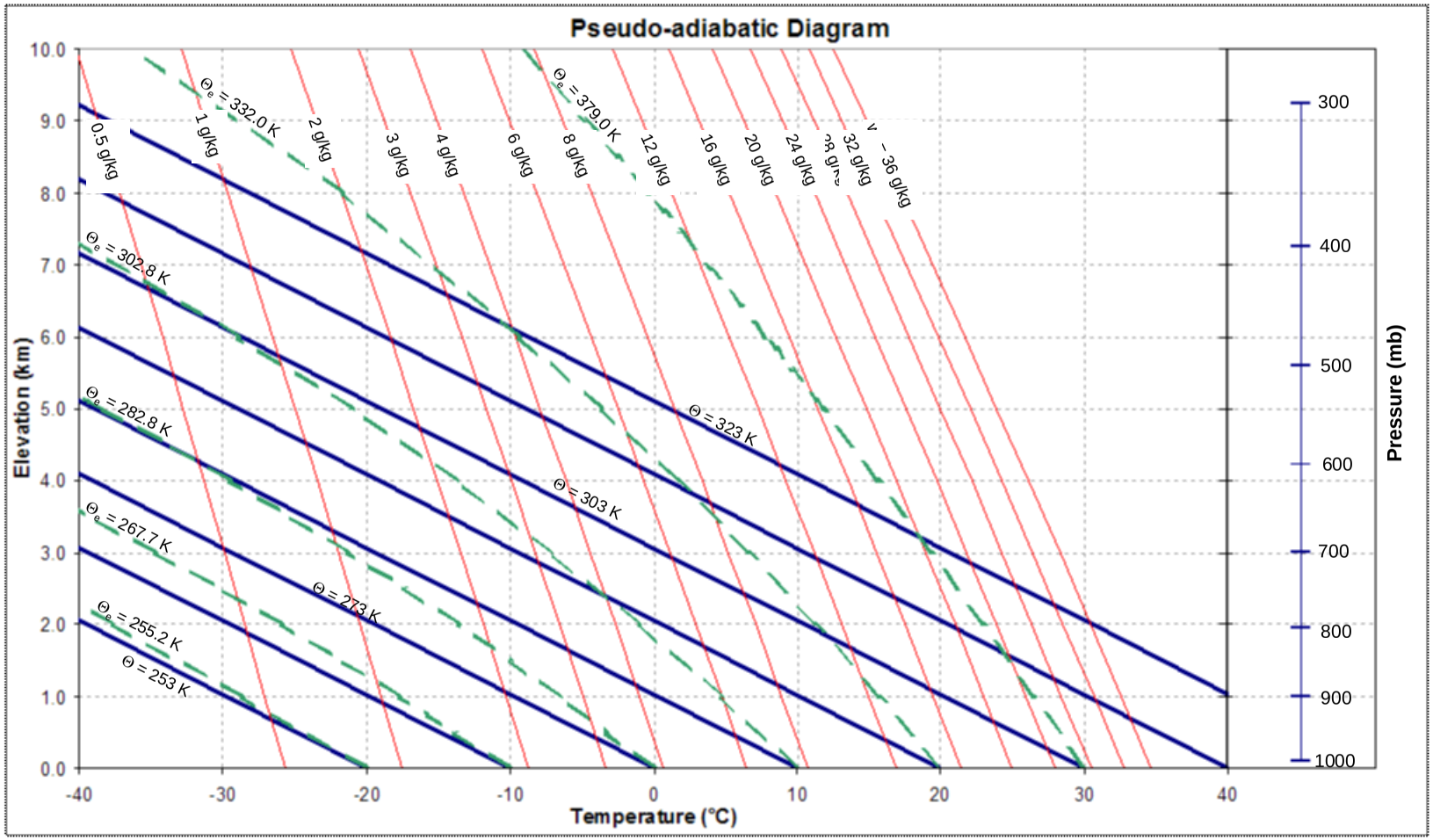
b – Parcel altitude 7,200 ft, temperature 30º F, vapor pressure 14.3 mb

3. Air at sea level, temperature 60º F, and 85% relative humidity ascends over a mountain range of maximum elevation 6000 ft. It then descends on the other side of the mountains to sea level again where it blows across a bay over a distance of 10 miles. Water evaporates from the bay into the air above. The influx of water vapor to the moving air can be specified for each 1-mile segment over this bay by:

$$w_{end} = w_{begin} + (w_s - w_{begin}) \cdot \left(1 - \exp(-3.3 \cdot w_{begin} / w_s)\right)$$

where w_{begin} is the mixing ratio at the beginning of the 1-mile segment, w_s is the saturation mixing ratio, and w_{end} is the mixing ratio at the end of the 1-mile segment. After blowing across the bay, the air ascends a second mountain range that is 3,000 ft in elevation and then blows back down to sea level again. *What is the temperature and relative humidity of the air at its final location?* (35 points)





"Dry Adiabats"; Lines of constant Θ; Follow in adiabatic processes

"Wet Adiabats"; Lines of constant Θ_e; Follow in pseudo-adiabatic processes

Lines of constant w_s

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