

## ES 3053 Homework Set #3

### Due: October 9, 2020

1. 20 points

One kilogram of saturated liquid water is contained in a frictionless piston and cylinder at 100°C. It is then heated at constant pressure until it is a saturated vapor. Using the steam table, compute  $\Delta s$  for the process using a) the entry for  $\Delta h$  and noting that  $\Delta h = q$  for a constant pressure process, and b) from the  $\Delta s$  entry in the table. Is the steam table consistent?

2. 30 points

Air is compressed from 25°C and 1 atm of pressure to 200°C and 10 atm pressure. Assuming air is an ideal gas, compute  $\Delta S$  for the process.

3. 20 points

Steam at 700°C and 300 kPa undergoes a process and ends up at 50 kPa and 200°C. Find  $\Delta s$  and  $\Delta h$  for the process.

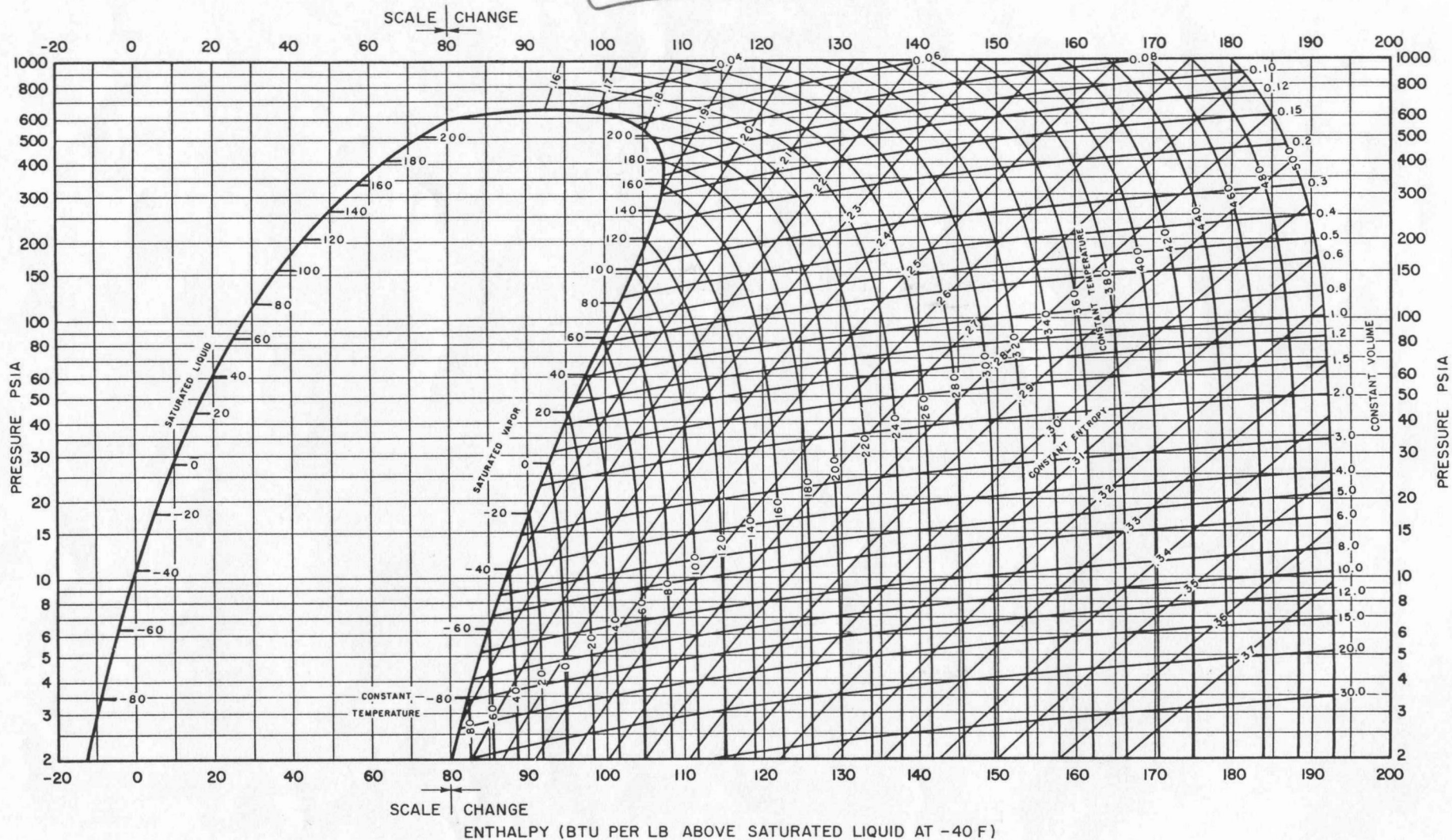
4. 30 points

R-500 is initially at 35 psia and 60°F. It is then compressed *at constant entropy* until it reaches 250 psia.

A) 10 points: Using a highlighting pen, mark the process on the attached R-500 diagram. (Remember to turn it back in with your solution).

B) 10 points: What is the final temperature?

C) 10 points: What is  $\Delta h$  for the process?



TEMPERATURE IN  $^{\circ}\text{F}$  VOLUME IN CU FT PER LB ENTROPY IN BTU PER LB PER  $^{\circ}\text{F}$

Fig. 9-11. Pressure-enthalpy diagram for refrigerant R-500. Note that 0 of enthalpy scale is taken at  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ). Also note that enthalpy scale changes at 80 Btu per lb. to help technician read superheat values.