ATM S 310

MIDTERM #1 (10/18/2023)

1. For the following logical statements, please describe whether the result will be True or False. **Note:** You must show intervening steps! For instance, if y = 2 and the logical statement is **(y < 2) or (y > 3)**, the intervening steps would be **False or False** and then **False** as the final answer. For each of the below, there will be two intervening steps and one final answer.
   Use the following values to evaluate the logical statements below:
   - a = 1
   - b = 2
   - c = -3

   (a) **(5 points)** ((a < b) or (a >= c)) and (a == 1)
   (b) **(5 points)** ((a != b) and (a <= c)) or (a <= c)
   (c) **(5 points)** ((a == c) or (b > c)) and (-a*b < c)
   (d) **(5 points)** (a <= 1) and ((b != c*a) or (b == a*b))

2. An atmospheric sounding is a vertical profile of temperature and dewpoint in the atmosphere. The following table shows part of an atmospheric sounding: temperature and dewpoint values measured at four different pressure levels.

Pressure (mmHg)	Temperature (K)	Dewpoint (K)
7.6	288.3	278.4
6.3	278.6	271.3
5.2	272.1	265.3
3.7	250.3	230.4

   The units used are millimeters of mercury (mmHg) for pressure and Kelvins for temperature and dewpoint. Your job is to write a **single function** that meets all of the following criteria:
   (a) **(5 points)** The function takes as its input argument a 2-D 3-column **array** of sounding data (like the above).
   (b) **(5 points)** Convert the pressure column of the array into hectopascals using the conversion **hPa = mmHg * 133.322**.
   (c) **(5 points)** Create (and initialize) a new array that contains the **dewpoint depression** (how much lower the dewpoint is compared to the temperature), calculated using the formula **dewpoint depression = temperature – dewpoint**.
   (d) **(5 points)** Using a **raise** statement, output a **ValueError** if the dewpoint depression is negative (since dewpoint cannot be higher than temperature).
   (e) **(5 points)** The function should return two variables: the new array with the converted pressure values, and the dewpoint depression.
   (f) **(5 points) Outside of the function**, convert the data above into an array and run the function to test that it works.

(g) **(5 points)** In words, describe what modifications you would have to make to your code (if any) if you were given 10 levels of data instead of just 4. ***You don't need to write the code, just describe in words the kind of solution you would need.***

(h) **(10 points)** In words, describe an error you can imagine happening in your code if you were given incorrect input (that is, if something were wrong in the table provided) apart from a negative dewpoint depression. How would you account for that kind of error? ***You don't need to write the code, just describe in words the kind of solution you would need.***

BONUS: (2 points) Share something you studied that wasn't on the midterm this time around!