ME 350 Homework 2 Winter 2017

Complete the following problems and upload your solutions to the dropbox before the start of the next class in the week beginning 30 January 2017.

1. **(6 points)** This problem extends your solution to problem 3 on Homework 1.

   a. Write an m-file function to compute the viscosity of water. The function should have one input, the temperature T, and one output, the viscosity, μ. Show that your function works by using it to compute $\mu(20)$ and $\mu(50)$.

   b. Write a second m-file function that makes the same plot that was required for problem 3 on Homework 1. Include that plot in your solution document.

   Hints

   a. The first function, the one that computes $\mu(T)$, only needs to evaluate the formula for $\mu(T)$. It does not need to, and *should not*, store the tabular data.

   b. Your function that computes $\mu(T)$ should accept both scalar T and vectors of T.

   c. Your second function should perform these steps

      i. Store the tabular data.

      ii. Generate a vector of T values that spans the range of the tabular data.

      iii. Call your first function to evaluate μ at the vector of T values generated in the previous step.

      iv. Plot the tabular data as open circles and the data generate with your function as red dashed curve.

      v. Label the axes and add a legend.

2. **(7 points)** Download the `drawBoard` and `fillCircle` functions from the web page for this homework assignment. Figure 1 is an annotated version of the skateboard profile created by `drawBoard`.

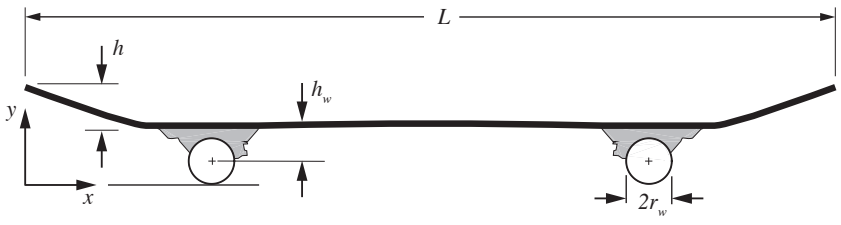

Figure 1: Dimensions of the skateboard profile created by `drawBoard`.

Write an m-file function called `stackThree` (or some similar name) that makes an image of a stack of three skateboards. `stackThree` should have three input arguments `L1`, `L2` and `L3`, that specify the lengths of the three skateboards in the stack. Run your `stackThree` function twice to create the two images shown in Figure 2. The first image has $(\texttt{L1}, \texttt{L2}, \texttt{L3}) = (80, 70, 60)$ and the second image has $(\texttt{L1}, \texttt{L2}, \texttt{L3}) = (80, 65, 70)$. Create two separate images, i.e., two separate figure windows.

Do not alter any code in `drawBoard.m`. Do not copy the code from `drawBoard.m` into your `stackThree` function. We will use the original `drawBoard` function to test your solution.

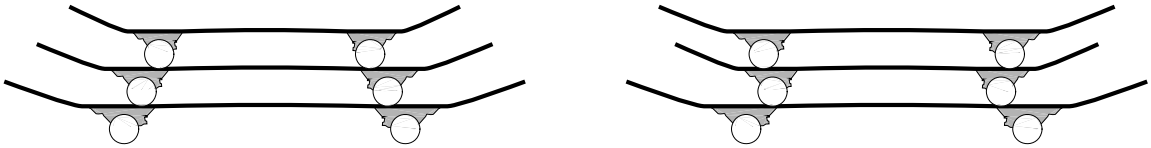

Figure 2: Solution to problem 2 in Homework 2. The image on the left is made with the command `stackThree(80,70,60)` and the image on the right is made with the command `stackThree(80,65,70)`. The boards are numbered from the bottom up.

Hints:

- You will need to use a `hold('on')` command after your first call to `drawBoard`. For good code hygiene, use a `hold('off')` command after the last (third) call to `drawBoard`.
- You can make the final image nicer by using `axes('off')` after the last board is drawn. While debugging your code it would probably be helpful to keep the axes in your image, and maybe even use `grid('on')`.

3. **(7 points)** To complete this problem, download the `loadDailyData` function and the `daily_Portland_airport.csv` data file from the web page for the homework. You will need to download other data files for part (b).

   a. Write an m-file function that uses data in `daily_Portland_airport.csv` to plot the average daily temperature, the average daily low temperature and the average daily high at the Portland airport. Label the axes and provide a legend for three curves. Your solution should look like Figure 3.

   b. Write another m-file function, or extend the m-file function for part (a), to plot a comparison of the average daily temperature from at least three locations around Oregon. This plot should only compare the daily average, not the average high and low temperatures.

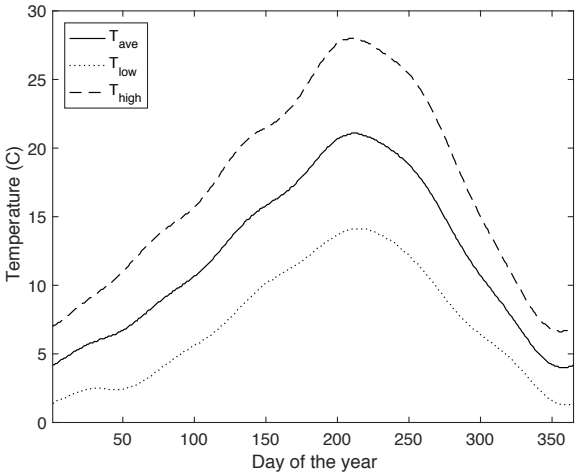

Figure 3: Daily averaged temperature data for the Portland International airport in Portland, OR.