CHEN 1703 - HOMEWORK 7

Submit your solutions via the course web site. Be sure to include your name and UNID in your m-file.
Submit each solution seperately. Also be sure to document your solutions well.
You do not need to submit a report for this assignment.

Problem 1 (5 pts)

Complete this survey. Full credit is given for completing the survey. Your honesty is appreciated.

Problem 2 (10 pts)

On homework 3 we solved the projectile motion problem. Repeat that problem with the following changes:

1. (2 pts) Plot the horizontal and veritcal positions as a function of time on the same plot.
2. (1 pts) Plot the speed as a function of time.
3. (7 pts) Print out a table of the horizontal position, vertical position, and speed as a function of time. This should be printed to a file called "projectile.out"

Recall that the speed is $\sqrt{v_x^2 + v_y^2}$.

Problem 3 (10 pts)

On homework 4 we considered an incineration problem. Repeat that problem but format the output so it looks like the following:

```
Component | Flow Rate | Flow rate
  Name    | (kmol/hr) |  (kg/hr)
----------+-----------+----------
   HCN    |    528    |  14269
   H2S    |     76    |   2590
   Air    |   7781    | 224480
   CO2    |    958    |  42162
```

Requirements:

1. (5 pts) The entries in the table must be printed using a loop.
2. (5 pts) The table should be formatted as close to the above as you can get it.

Problem 4 (20 pts)

Write a MATLAB code to implement linear interpolation for the vapor pressure data discussed in class. Allow the user to enter the temperature and then interpolate the data and write the results to the screen. Obtain the results in four different ways:

1. Using linear interpolation and the equation we discussed in class, $y = \left(\frac{y_2 - y_1}{x_2 - x_1}\right)(x - x_1) + y_1$.
2. Using a polynomial that exactly interpolates *all* of the data. You must formulate this by solving the system of equations to solve for the polynomial coefficients.
3. Using MATLAB's `interp1` function and linear interpolation.
4. Using MATLAB's `interp1` function and spline interpolation.

Compare these results to the results of the Antoine equation:

$$\log_{10}(p) = a - \frac{b}{T + c}.$$

For water, the parameters a, b, and c are given in Table 1. Be sure to use the appropriate set of coefficients for temperatures in any range from 0 to 150 $^\circ C$. You should format your output neatly (see example below) and label your results with units.

Table 1: Antoine equation coefficients for water. These coefficients assume T in $^\circ C$ and p in mmHg.

T Range ($^\circ$C)	a	b	c
0-60	8.10765	1750.286	235.0
60-150	7.96681	1668.21	228

For example, given $T = 56.7\,^\circ$C you should obtain the following:

```
The vapor pressure of water (mm Hg) at 56.700 Celsius
is shown below for various approximations.

manual  linear   polynomial  interp1-linear  interp1-spline  Antoine
------------------------------------------------------------------
    130.613      127.579         130.613         127.986    128.019
```