EXAM 1 – COMPUTER PORTION

Put all of your code in one script and name it `lastname_firstname.m` (all lower case). Include your name, section number, and CM number in the header section of your code. **There should be no output other than what is requested**.

Problem (50 pts)

For this exam problem, we will work with the Excel file `Car.xls` posted on the course website. The file contains data for the Toyota Corolla's impact with the barrier. Time (in seconds) is recorded in the first column, the second column contains the acceleration of the floor pan in g's, and the third column contains the velocity of the engine in m/s.

a) (15 points) Download the Excel file from the course website. Load the contents of the file into MATLAB. **Do not** hard code the dimensions of the loaded array. Convert the floor pan accelerations to m/s^2 by multiplying them by 9.8 m/s^2. Leave the time data in seconds. Plot the acceleration data over time using a **solid black line**. Add good axis labels and a title.

b) (15 points) Now we will work with the engine velocity data. Add code to your script to find out the time at which the velocity of the engine drops below 4 m/s. Print your time result to the **Command Window** using the following words:

```
The engine velocity drops below 4 m/s at time x.xxxx seconds.
```

Here, `x.xxxx` is your result, which must be printed using the specified format and a variable. (That is, **do not** just look at the result and type it into the `fprintf` statement.)

c) (20 points) The integral of acceleration is velocity:

$$v(t) = v_0 + \int_{-0.05}^{t} a(t)\, dt$$

For this car the initial velocity v_0 is 56.37 kph (kilometers per hour) = 15.66 m/s. Using numerical integration, calculate the velocity of the floor pan as a function of time. This means you must compute the velocity at every time value:

$$v(-0.05) = v_0 + \int_{-0.05}^{-0.05} a(t)\, dt$$

$$v(-0.0499) = v_0 + \int_{-0.05}^{-0.0499} a(t)\, dt$$

$$\vdots$$

$$v(0.2999) = v_0 + \int_{-0.05}^{0.2999} a(t)\, dt$$

(over)

On a **new figure** (i.e., **do not** overwrite your first graph), plot the floor pan velocity as a function of time using a **solid black line**. Add good axis labels and a title.

When you are finished, put your script (`lastname_firstname.m`) in the Moodle assignment dropbox.

NOTE: All programming must stop 5 minutes before the end of the period. You will have 5 minutes after that to post your file to Moodle if you need that time.