Phys338/Homework #4
Due on Monday 12/10/2020

Required Problem for homework:

Write a code using Simpson's rule to calculate the time needed for a spacecraft to be sent from the earth orbit to the moon as a function of its initial speed in two cases (a) when ignoring moon's gravity (b) when accounting for moon's gravity. Assume that the moon and earth are fixed and the spacecraft can just take a straight-line trip between the earth and the moon.

Notes: 1) A spacecraft cannot leave earth orbit unless it has sufficient initial speed.

2) The mass of earth= $5.972*10^{24}$ kg, The mass of the moon=$7.348*10^{22}$, The radius of earth=6371 km, The radius of the moon=1737 km, the distance of between earth and the moon=384400 km.

Bonus Problem:

A 45000 kg spacecraft at 1000km orbit from the earth surface and carries 40000kg of fuel that can be exhausted at speed of 2500 m/s. You would like to send this spacecraft to a 1000km of the moon and back immediately with the shortest period of time by firing its rockets only twice within extremely short time intervals (once you leave earth and when you head back and not limit on the rate of fuel burning). Assume that the moon and earth are fixed and the spacecraft can just take a straight-line trip between the earth and the moon.

Suggested Individual project:

The mass of spacecraft at 1000km orbit from earth without its fuel is 5000kg. You would like to send this spacecraft to a 1000km of the moon and back with the lowest initial fuel load. Assume that fuel can be burned at a maximum rate of 100kg/s and exhausted at speed of 2500 kg. You should also include the presence of the sun, orbital motion of the earth and orbital motion of the moon in your calculations.