PHYS 20323 PROJECT – Fall 2021 Due Friday Dec. 17 (11am)

This is a take home exam project and as such has a number of rules.
*1. You may not consult about the exam questions with **anyone except for me.***
2. The Exam is due Friday, Dec 17th by 11:00am emailed to me.

A satellite is to be launched into a circular orbit around a planet so that it orbits the planet once every T seconds.

The altitude *h* above the Planet's surface that the satellite must have is:

$$h = \left(\frac{GMT^2}{4\pi^2}\right)^{1/3} - R$$

where $\mathrm{G} = 6.67 \times 10^{-11}$ m^3 kg^{-1} s^{-2} is Newton's gravitational constant, M (kg) is the mass of the Planet, and R (km) is its radius.

1) Write a program that asks the user to enter the desired value of T and then calculates and prints out the correct altitude in meters. (60 Points)

2) Use your program to calculate the altitudes of satellites that orbit the Planet once a day (so-called "geosynchronous" orbit), and three other orbital periods. (30 Points)

3) What do you conclude from each of these calculations? (20 Points)

4) Technically a geosynchronous satellite is one that orbits the Planet once per sidereal day. Why is this? And how much difference will it make to the altitude of the satellite? (20 Points)

For full credit: Email me a report (written in LaTeX) including all required outputs and plots, and a user-friendly working self-contained Jupyter notebook.

	MASS	RADIUS	DAY	SIDEREAL DAY	OTHER
Michael Aboukhair	1.898 x 10^{27} kg	69,911 km	9.950 hrs	9.825 hrs	50, 15, 5 hr