Lab 2

Stat 427

Fall 2020

Instructions:
Complete all questions. To prepare for the randomly collected lab, you will need to do the following to prepare the work for submission. These submission rules will apply to all labs throughout the semester.

Preparing your lab work for submission:
Answer the questions from the assignment (not all items in the assignments will have answers) in a word doc, copy and paste the code (from your script) and all output as well. When I actually collect a lab, then just upload the one (1) word doc to BbLearn (you can upload either Word or PDF only).

R Scripts (so yes please, write all in a script)

(1) According to Newton's univeral law of gravitation, the acceleration of an object in the direction of the sun due to the sun's gravity can be written in the form:

$$a = \frac{1}{r^2}$$

where r is the distance of the object from the sun's center, in astronomical units (AU) of distance. One AU is the average distance of the Earth from the center of the sun, about 150 million kilometers. The units of a are scaled for convenience in this version of Newton's equation so that one unit of acceleration is experienced at a distance of 1 AU. Use the equation to calculate the gravitational accelerations of each of the planets' average distances from the sun.

Planets	Distance
Mercury	0.390
Venus	0.723
Mars	1.524
Jupiter	5.203
Saturn	9.539
Uranus	19.180
Neptune	30.060
Pluto	39.530

[Note: Pluto is considered to be a dwarf planet (or the likes) that originated from the Kuiper Belt.:-(poor Pluto. I ♡ Pluto]

(2) Using the data from the first problem, create a graph of the gravitational acceleration a versus a range of values of r ranging from around 0.4 AU to arpund 5.2 AU (basically the distance from Mercury to Jupiter). According to Newton's gravitational law, is there any distance at which the sun's gravity is escaped entirely?