Atoms to Universe
Physics 340
Assignment 4

1. How did Newton use Galileo's work to develop his dynamics?

2. If you rotate a bucket of water around the vertical axis of the bucket, what happens to the water surface as the speed of rotation increases? How does this relate to the rotating earth?

3. Newton rejected Galilean relativity and argued that there was a universal rest frame which he thought was the center of mass of the solar system. See https://archive.org/stream/100878576#page/400/mode/2up page 401 of the Principia Hypothesis i and Proposition XI. What do you make of this argument.

Also argue that his three laws of motion actually support Galilean relativity.

4. Show that the earth and the outer planets obey Kepler's third law (the cube of the radius of the orbit over the square of the period of the planet is the same for all of the planets) Find the periods and radiuses of the orbits on the web.

5. In the Principia https://archive.org/stream/100878576#page/384/mode/2up page 384 Newton gives his rules of Philosophy for studying Nature. Comment on them.

[Brief table of commonly used prefixes: n = nano = 10^{-9} = 1/1,000,000,000
μ = micro = 10^{-6} = 1/1,000,000
m = milli = 10^{-3} = 1/1,000
c = centi = 10^{-2} = 1/100
d = deci = 10^{-1} = 1/10
h = hecta= 10^2 = 100
K = kilo = 10^3 = 1000
M = Mega = 10^6 = 1,000,000
G = giga = 10^9 = 1,000,000,000]

It is interesting that in scientific notation, names are given only up to Y= Yotta= 10^{24}, whereas in classical Japanese there are names for numbers at least all the way up to 10^{52}.

http://en.wikipedia.org/wiki/Japanese_numerals.

(The Japanese use 10000=10^4 as the multiple for names, rather than our 1000.) Why in the 16th century anyone would need to give such a large number a name I do not know. This aside is of course totally irrelevant to the course.