Sept 18th, 2012
P340: Homework Assignment No. 1

DUE DATE: Monday, Oct 1st., 2012
Please note that late assignments will not be marked

(1) The 4 Causes: Aristotle argued that a complete understanding of any physical object could be attained once the 4 'Causes' of that object had been exhaustively described.

(i) Explain what he meant by this, and explain what each cause was.

(ii) Now illustrate what you have said by explaining, in as much detail as you can, what you think are the 4 causes for (a) a stone on the seashore, and (b) a clock.

(iii) subsequent to the Greeks, the idea of a 'Final Cause' was adapted by various people into the 'argument from design', which has been used to argue that just as a clock has a designer, so must the universe. Give a discussion of roughly 300-400 words of your opinion of this argument (NB: what I am interested in here is not really your opinion, but rather your arguments in support of it).

(2) The Epicycle Theory: One of the apparent successes of the Epicycle theory was its explanation of the apparent retrograde motion of planets in the sky.

(ii) first explain in detail how the epicycle theory, in the later form developed by Ptolemy, was supposed to work. You should use pictures to help explain your argument.

(ii) Now, show how Jupiter appears to move in the sky as seen from earth.

(iii) Now describe in detail how the Ptolemaic epicycle theory was supposed to explain the motion of Jupiter (again witt the help of pictures)

(iv) Finally, show how the modern picture of planetary motion explains the apparent motion of Jupiter in the sky.

(3) Infinitesimals and Axioms: Two of the key ideas from Greek mathematics, viz., the idea of the infinitesimal, and the idea of an axiomatic system, have had a huge influence on the subsequent development of science.

(i) Explain Zeno's parable of Achilles and the tortoise, and why Zeno thought that this parable demonstrated a contradiction. Then, explain the Archimedean idea of an infinitesimal, and how use of this idea allows us to resolve the paradox/contradiction raised by Zeno.

(ii) Now explain what is meant by an axiomatic system; you should discuss both the idea of a formal axiomatic system and how it is constructed, and also the 'interpretation' of the axiomatic system. Then, by way of an example, attempt to give the rules, symbols, and axioms that would allow one to define the game of "Snakes and Ladders". Notice that a picture of the game, with squares, snakes, and ladders, etc., is not what is being asked for here (such a picture would actually be an interpretation of the game, in terms of an image); you are being asked for the kind of information that would allow a computer to generate a game of snakes and ladders.