

Jan 30th, 2004

P340: Homework Assignment No. 2

DUE DATE: Monday, 23rd FEB. 2004

Please note that late assignments will not be marked

(1) Solar System: The picture we have of the solar system evolved considerably over the period between the time of the Ancients and that of Kepler. Give a brief description (roughly 500 words) of the different views of the solar system structure that prevailed during this time, and of how the movements of the planets were explained in these different views.

(2) Retrograde motion: Describe what is meant by the *retrograde* motion of a planet in the sky, and *why* it is that we see this retrograde motion (according to modern physics). You should use pictures to help explain these ideas.

(3) Telescopic images: Francis Bacon believed in something that has been called "Immaculate Perception", viz., that "all depends on keeping the eye steadily fixed upon the facts of nature and so receiving their images simply as they are." Such 'theory-free' observation is considered by some to be the foundation of scientific work- although Bacon himself was careful to note the role of reason and the human perceptive apparatus in observations.

(i) Galileo observed the satellites of Jupiter using a refracting telescope. Show using a simple diagram how the light passes through such a telescope, as it comes in from Jupiter, and is received by the eye.

(ii) It is always open to someone to say (as did some cardinals in Rome, when faced by Galileo's magic 'light tube'), that the telescope is nothing but a trick, and that there is no reason to believe what one apparently sees through it. What arguments would you use to convince them that your explanation in (i) is the correct one?

(4) Newton's Laws: Give a concise explanation of what each of Newton's 3 laws of dynamics say. You should pay careful attention to explaining how the various quantities like distance, time, acceleration, mass, and force are to be defined, in the real world. If it helps to give examples then by all means do so.

Then explain what is Newton's law of Gravitation between masses. In order to give a proper definition of all the quantities involved in his 3 laws you may also have to refer to the law of gravitation.

Finally- explain how you would *test* Newton's 3 laws (ie., give evidence to show that they are true). Note that one way of doing this is to imagine how you might show they are *false*, ie., devise a method of falsifying one or more of them.