Physics 109 Midterm Review: the Midterm will be Five of the Questions Below.

1. Explain briefly the Babylonian number system, use 1’s and <’s to write 3, 13, 63, 103. State one good thing and one not so good thing about this number system.

2. Approximately when and why did the Babylonians introduce weights and measures? What was good about their system?

3. Give some examples of Babylonian measure that we still use.

4. Approximately when and where was Thales? What did he contribute to the development of science? How did he measure the height of a pyramid? How did he measure the distance away of a ship?

5. According to the historical record, who first did geometry? And why? Explain.

6. Approximately when and where was Pythagoras? Briefly, what did his followers believe? Why did they thing the stars moved across the sky daily?

7. Draw a couple of diagrams to prove Pythagoras’ Theorem, that is, reproduce two equal squares containing four identical triangles, as in the web page.

8. Reproduce the Pythagoreans proof that the square root of two is irrational, that is, it isn’t a fraction.

9. Approximately when and where was Socrates? What did he spend his time doing? How and why did he die?

10. Approximately when and where was Plato? What institution did he found? What was its purpose? What did it say above the doorway?

11. Describe with sketches Plato’s Five Regular Solids. Prove that there can only be five.

12. Plato made a specific suggestion to the astronomers as to how they should try to account for the motion of the planets. What was it?

13. Approximately when and where was Aristotle? What was his school called? What were the four elements? Why did things move? What’s the difference between what he called “natural motion” and “violent motion”? What were his quantitative rules of falling motion?

14. Approximately when and where was Eratosthenes? Describe how he figured out the size of the earth.

15. Approximately when and where was Aristarchus? Explain how he figured out the distance to the moon.
16. How did Aristarchus try to find the distance to the sun? How accurate was he? What important conclusion could he reach anyway?

17. Approximately when and where was Archimedes? How did he prove the crown was a fake?

18. How did Archimedes find a good approximation to $\pi$? Draw a couple of diagrams to show $\pi$ must be between 3 and 4.

19. On October 1 the moon was crescent shaped, about one quarter illuminated, clearly visible after sunset. Draw a diagram showing the relative positioning of the earth, the sun and the moon at this phase.

20. If you looked through a telescope at Venus, would you see phases? If you did, what would be the apparent size of Venus at “full” as opposed to “crescent”?

21. If you looked through a telescope at Mars, would you see phases? If you did, what would be the apparent size of Mars at “full” as opposed to “crescent”?

22. If you lived on the moon and watched the earth, would you see phases? Would you ever see the earth eclipse the sun? Would you ever see the earth set?

23. At this moment in time, is there anywhere on earth where the sun is directly overhead? Is there more than one place? Can you guess, very approximately, what the latitude(s) of the place(s) might be?

24. Draw a diagram making clear how an eclipse of the moon happens, and explain why there isn’t one every month.

25. Explain why we have seasons, with diagrams. What days mark the beginning of each season?

26. Give a brief account of Eudoxus’s mechanism of the solar system.

27. How did Hipparchus and Ptolemy account for the difference in length of the four seasons? How is it accounted for now?

28. How did Ptolemy account for the retrograde motion of Mars? How is it accounted for now?

29. Sketch Ptolemy’s picture of the motion of Venus. Does it correctly account for the observed phases of Venus? Does Copernicus’s picture predict different phases of Venus than Ptolemy’s?

30. How did Galileo estimate the height of mountains on the moon?

31. Why did the discovery of Jupiter’s moons make Copernicus’s picture more plausible?

32. Why didn’t Galileo believe in giants?