**Mathematics 3010 Spring 2013** **Midterm** **Name: _____**

1. (3 pts) Who was Aristotle's most famous student?

2. (5 pts) Write the number one million using Babylonian numerals.

3. (6 pts) Show how to do the multiplication $13 \cdot 25$ using the Egyptian method (but modern numerals).

4. (6 pts) Use the Babylonian approach to find the length of a diagonal of the concave square in terms of its arc length *a*.

5. (4 pts) Using basic principles (and not knowledge of modern functions), compute the crd of 120 degrees in a circle of radius R.

6. (4 pts) What is the altitude of the sun at noon on the summer solstice at a point at 30 degrees north latitude?

7. (6 pts) For a lever 12 meters long, where should the fulcrum be placed so that a 4 kg weight and a 6 kg weight are in equilibrium (draw a picture to make your answer more clear)?

8. (10 pts) Find the length of sunlight at a spot at 40 degree north latitude on the day halfway between the vernal equinox and the summer solstice.

9. (4 pts) Describe what Ptolemy meant by the word “planet”.

10. (5 pts) Give an example of an error in Euclid’s thinking.

11. (6 pts) Prove that if a triangle XYZ is inscribed in a circle such that XZ is a diameter, then Y is a right angle.

12. (6 pts) Prove that for any triangle PRS, the sum of the angles P, R, and S is 180 degrees.

13. (7 pts) Give a (convincing!) picture proof of the Pythagorean theorem.

14. (4 pts) Explain the distinction between number and magnitude.

15. (4 pts) Give an example of a pair of incommensurable magnitudes.

16. (6 pts) List three of Archimedes' inventions.

17. (6 pts) For the parabola $y = x^2 + 1$, find the *y*-intercept of the tangent line at the point (-3,10) using Apollonius' solution to this problem.

18. (8 pts) Find the area between the parabola $y = 2x^2$ and the line y=3 using Archimedes' formula.