Mathematics 3810H – Ancient and classical mathematics

(Formerly Mathematics 3810H)

Trent University, Fall 2009

Assignment #3

Due on Friday, 23 October, 2009

Magnitudes

Eudoxus of Cnidus (*c.* 410–350 b.c.) was one of the great early Greek mathematicians, who also worked in astronomy and philosophy. Unfortunately, all of his writings are now lost, and we only have the word of (sometimes much) later commentators for what he accomplished. The theory of proportions Eudoxus is supposed to have developed allowed ancient Greek mathematicians to rigourously handle quantities that were not necessarily rational. Some of it seems very strange to modern eyes and ears, though. For one thing, the quantities in question were conceived of as geometric magnitudes, such as length or area, rather than numbers in a number system extending the rationals.

Consider the following two statements, taken from a translation of a Greek work believed to have been written a century or two after Eudoxus' time, the relevant part of which is believed to be based on his work on proportions:

> Definition. Magnitudes are said to be in the same ratio, the first to the second, and the third to the fourth, when equal multiples of the first and the third either both exceed, are both equal to, or are both less than, equal multiples of the second and the fourth, respectively, being taken in corresponding order, according to any kind of multiplication whatever.
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> Proposition. If there are any number of magnitudes whatsoever which are equal multiples, respectively, of some other magnitudes, of equal number to them, then as many times as one of the first magnitudes is divisible by one of the second, so many times will all of the first magnitudes also be divisible by all of the second.

1. What does the proposition given above state, in modern terms? *[5]*

2. What does the definition given above state, in modern terms? *[5]*

3. What is the significance of the definition given above? *[5]*

4. Try to prove the given proposition in the style in which it is stated. *[5]*