Mathematics 3810H – Ancient and classical mathematics

(Formerly Mathematics 3810H)

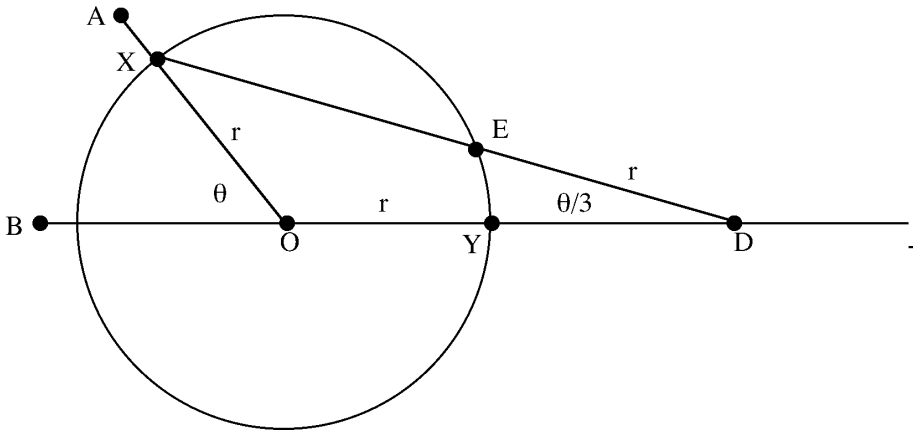
Trent University, Fall 2009

Assignment #4

Due on Friday, 13 November, 2009

Trisections

1. Show that the following construction for trisecting an angle using a compass and a ruler with two marks (a distance of r apart) works.



Given that $\angle AOB = \theta$, draw a circle with centre O and radius r. Suppose this circle intersects OA at X and the line extending BO past O at Y. Slide the ruler around until its edge runs through X, one mark is on the line extending OY past Y, and the other mark lies on the circle. Let D be the point on the line where the first mark is and E be the point on the circle where the second mark is. Then $\angle EDY = \theta/3$. *[6]*

2. Some angles *can* be trisected using a compass and an unmarked straightedge. Give an example of such an angle and the corresponding construction. *[6]*

3. Describe some of the tools besides a compass and an unmarked straightedge that Greek and Hellenistic geometers used to make possible trisections that cannot be accomplished with a compass and straightedge alone. *[8]*