

MA 350 Dr. G. Stoudt
Eighth Reading Assignment

Readings

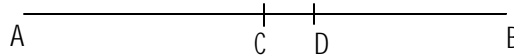
- Biography of Apollonius
- Reading 42: From *Conics*: Introduction to Book One-Apollonius
- Reading 43: From *Conics*: Propositions 7 and 11-Apollonius (Proposition 11 only)
- Handout: From *Conics*: Proposition 33-Apollonius

Notes for the Readings

Conics Prop. 4: If either one of the vertically opposite surfaces is cut by some plane parallel to the circle along which the straight line generating the surface is moved, the plane cut off within the surface will be a circle having its center on the axis, and the figure contained by the circle and the conic surface intercepted by the cutting plane on the side of the vertex will be a cone.

Conics I.20: If in a parabola two straight lines are dropped ordinate-wise to the diameter, the squares on them will be to each other as the straight lines cut off by them on the diameter beginning from the vertex are to each other.

Elements II.5: If a straight line is cut into equal and unequal segments, the rectangle contained by the unequal segments of the whole together with the square on the straight line between the points of section is equal to the square on the half.



This might help: C bisects AB (equal segments). Let AB be b and let DB be x .

Elements V.9: Magnitudes which have the same ratio to the same are equal to one another; and magnitudes to which the same has the same ratio are equal.

Elements VI.2: If a straight line be drawn parallel to one of the sides of a triangle, it will cut the sides of the triangle proportionally; and, if the sides of the triangle be cut proportionally, the line joining the points of section will be parallel to the remaining side of the triangle.

Elements VI.4: In equiangular triangles the sides about the equal angles are proportional, and those are corresponding sides which subtend the equal angles.

Elements XI.10: If two straight lines meeting one another be parallel to two straight lines meeting one another not in the same plane, they will contain equal angles.

Elements XI.15: If two straight line meeting one another be parallel to two straight lines meeting one another, not being in the same plane, the planes through them are parallel.
Please do not be fooled by the diagram on page 164. ZH is parallel to $A\Gamma$ as is stated “...let the diameter of the section be parallel to one side of the axial triangle.”

In the handout reading, “sq. FB ” mean the square on FB ; that is FB^2 .

Questions for Discussion

Reading 42

You will do most of this for homework.

Reading 43

1. When *Elements* VI.2 and VI.6 are cited on page 165, what similar triangles are being used?
2. Be able to follow the steps on pages 164-165 and be prepared to justify each one.

Handout Reading

1. What does *Elements* II.5 say algebraically?
2. Write out what *Conics* I.20 is saying. Draw a picture.
3. What is Apollonius constructing here?
4. Be able to follow the steps and be prepared to justify each one.

Homework Problems

1. For the definitions on page 162 that I list below, draw pictures of what you think the definition means. Whenever a “plane curve” is mentioned, use a parabola or an ellipse; whenever “a pair of plane curves is mentioned, use the two branches of a hyperbola.

Diameter, vertex, drawn ordinatewise, transverse diameter, erect diameter, conjugate diameters, axis, conjugate axes.

2. In Reading 43 (on page 164) it is claimed that $M\Lambda \times \Lambda N = K\Lambda^2$. Prove this fact using the Pythagorean Theorem and *Elements* III.31: In a circle the angle in a semicircle is right.
3. Prove *Conics*: Proposition 33 **using calculus** in two special cases:
 - a. the parabola $y = x^2$;
 - b. the parabola $y^2 = x$.