Lesson 13: Analytic Proofs of Theorems Previously Proved by Synthetic Means

Classwork

Opening Exercise

Let , and be vertices of a triangle.

* 1. Find the coordinates of the midpoint of and the point that is the point one-third of the way along , closer to than to .
  2. Find the coordinates of the midpoint of and the point that is the point one-third of the way along , closer to than to .
  3. Find the coordinates of the midpoint of and the point that is the point one-third of the way along , closer to than to .

Exercise 1

* 1. Given triangle with vertices , , and find the coordinates of the point of concurrency.

* 1. Let , and be vertices of a triangle. Where will the medians of this triangle intersect?

**Exercise 2**

Prove that the diagonal of a parallelogram bisect each other.

Problem Set

1. Point is the midpoint of segment . Find the coordinates of :
2. is the midpoint of segment . If A has coordinates , what are the coordinates of ?
3. Line is the perpendicular bisector of segment with and .
   1. What is the midpoint of ?
   2. What is the slope of ?
   3. What is the slope of line ? (Remember, it is perpendicular to .)
   4. Write the equation of line , the perpendicular bisector of .
4. Find the coordinates of the intersection of the medians of given ,, and
5. Use coordinates to prove that the diagonals of a parallelogram meet at the intersection of the segments that connect the midpoints of its opposite sides.
6. Given a quadrilateral with vertices ,, , and :
   1. Prove quadrilateral is a parallelogram.
   2. Prove is a point on both diagonals of the quadrilateral.
7. Prove quadrilateral with vertices ,,, and is a trapezoid.
8. Given quadrilateral with vertices ,,, and
   1. Is it a trapezoid? Explain.
   2. Is it a parallelogram? Explain.
   3. Is it a rectangle? Explain.
   4. Is it a rhombus? Explain.
   5. Is it a square? Explain.
   6. Name a point on the diagonal of . Explain how you know.