

## Math 467 (Modern Geometry)

### First Examination Review

The examination will address definitions, theorems, examples, and proofs. This review sheet is largely a topical summary. As discussed in class, what is not so well represented here is the complex of ideas based on less elementary techniques in proofs (e.g., area comparisons, similarity), with which you should also be familiar. Homework problems are another good review.

### Basics

#### A. Congruent Triangles

**Definitions** Triangle types: isosceles, equilateral, acute, right, obtuse

**Definitions** Special lines in triangles: altitude, median, perpendicular bisector, angle bisector

**Concept** Congruence (definition, SSS, ASA, SAS, HL)

**Application** Isosceles triangles

- Pons Asinorum
- Applications in circle constructions

#### B. Angles and Parallel lines

**Definitions** Angles: vertical, supplementary, complementary, corresponding, alternate interior

**Application** Angle identities in polygons

- Sum of interior angles in triangles/polygons
- Exterior angle in a triangle

#### C. Area in triangles

**Formulas** E.g.,  $(1/2)bh$ ,  $(1/2)ab \sin(C)$ , Heron's formula

**Formula** Law of sines

**Applications** Theorem 1.12, Problem 1.13

## D. Circles and arcs

**Existence of circles** Theorem 1.15

**Angles and arcs** Numerous results computing angles from subtended arcs (Theorems 1.16, 1.18, 1.19)

**Application** Characterization of right angles inscribed in a circle.

**Application** Angles between secants and tangents

## E. Polygons in circles

**Definition** Regular polygon, apothegm

**Application** *Every regular polygon can be inscribed in a circle.*

## F. Similarity

**Concept** Similarity (definition, AAA, AA, SSS, SAS)

**Application** “Workhorse” lemma

## Triangles

## A. Circumcenter

**Coincidence** Perpendicular bisector, circumcenter (existence), circumradius

**Application** Extended law of sines

## B. Centroid

**Coincidence** Median, centroid (existence and location)

**Application** Equal medians and isosceles triangles

## C. Orthocenter

**Definition** Euler line

**Coincidence** Altitude, orthocenter (existence and location)

**Definition** Pedal points, orthic triangle

**Definition** Euler points

**Application** Nine-point circle (definition, existence)

## D. Incircle

**Coincidence** Angle bisector, incenter (existence)

## E. Computations

**Formulas** Law of cosines, Heron's formula (proof), Stewart's formula