Math 623 Geometry Fall 22 Sample Midterm

(1) (a) Define a regular polygon and give an example of a construction for one.
  (b) State Euclid's parallel postulate.
  (c) Explain neutral geometry.
  (d) State any two of Euclid's common notions.
  (e) Is Euclidean geometry complete? State one additional postulate which we need to make the proofs complete.

(2) Decide if the following statements are true or false. Give a short explanation.
  (a) Playfair's postulate is valid in neutral geometry.
  (b) Quadrilaterals with equal angles are similar.
  (c) If two chords of a circle bisecr each other, then they are both diameters.
  (d) It is possible to construct a regular 170-sided polygon.
  (e) It is possible to construct a regular 140-sided polygon.

(3) Prove any one of the following.
  (a) The sum of the interior angles of a triangle is equal to two right angles.
  (b) Triangles with the same base, and whose third vertex lie on a common parallel line to the base have the same area.

(4) Prove any one of the following:
  (a) In equal circles, equal central angles subtend equal arcs.
  (b) In equal circles, equal arcs are subtended by equal chords.

(5) Prove any one of the following:
  (a) Every point on the perpendicular bisector of a line is equidistant from the endpoints of the line.
  (b) Every point that is equidistant from the endpoints of a line lies on the perpendicular bisector.

(6) Prove that the sum of the opposite angles of a cyclic quadrilateral are equal to two right angles.

(7) State and prove Pythagoras's Theorem.

(8) Show how to bisect a given angle.

(9) Show how to construct a square.