MATH 402 Homework 2
Due Friday 9/9/16

(1) (*10 pts.*) Write down the definition of what it means for two points P, Q to be on the *same side* of a given line l. Then define what does it mean for a point in the plane to be *inside* a triangle. Finally, prove that if P is inside a given triangle $\triangle ABC$, and Q is outside $\triangle ABC$, then the *line PQ* intersects at least one side of $\triangle ABC$.

    Hint: You are allowed to use the following fact without proof: Suppose $\angle XYZ$ is a given angle with vertex Y, and which is less than $180°$. Let W be an interior point of $\angle XYZ$. Then the ray $\overrightarrow{YW}$ intersects the segment $\overline{XZ}$. **For bonus 5 points, prove this result.**

(2) (*10 pts.*) Use the exterior angle theorem to show that the sum of the angles of a triangle is always less than or equal to 180 degrees. Can you prove that the sum of the angles of a triangle must be exactly 180 degrees? What do you need to use?

(3) (*5 pts.*) Solve Exercise 2.5.3 from the book.

(4) (*5 pts.*) Solve Exercise 2.5.4 from the book.

(5) (*10 pts.*) Show that three distinct points on a circle cannot be collinear.

(6) (*5 pts.*) Read and understand the proof of Theorem 2.30. Write down the statement of the theorem, and then write the proof in *your own* words.