1. You and two of your friends -- one in Houston the other in Dallas -- are charged with determining the circumference of the earth (approximately). Not remembering, but determining. Each of you has the following information and tools with which to work:

   A general knowledge of mathematics up to, say, plane geometry.
   The earth is approximately a sphere.
   A clock synchronized with those of the other two.
   A protractor.
   A telephone – and the numbers to the telephones of each of the others.
   It is exactly 200 miles from San Antonio to Houston, which is due east of SA.
   It is 350 miles from SA to Dallas, which is due north of SA.
   Paper and pencil.
   Static objects in SA, Dallas, and Houston.

Neither you nor your friends have access to the web or science textbooks or a library or the calculator function on your cell phone or other friends or anything else. Oh, and you can only make one phone call.

So … how would you determine the approximate circumference of Earth?

2. a) We gave a proof of the Spherical Law of Sines for the case of an altitude that met the opposite side of the triangle (on the triangle itself).

   Can you provide a proof in the case where the altitude meets the opposite side outside the triangle (opposite side extended)? If you can, do it.

   b) We gave a proof of the Spherical Law of Cosines for the case where the altitude met the opposite side outside the triangle.

   Can you provide a proof in the case where the altitude meets the opposite side on the triangle itself? If so, do it.

3. We developed a formula for the area of a spherical triangle. What, if any, is the relationship between the area of a triangle ABC and the area of the polar triangle A’B’C’ of triangle ABC?

4. If there is no triangle under the given conditions below, indicate so. Otherwise, solve the triangle.
a) In a standard right triangle ACB (right angle at C) with angle $\alpha = \pi/4$ and side $a = .3$, what are the other sides and angle?

b) In a standard right triangle ACB (right angle at C) what are the measures of the 3 sides if $\alpha = \beta = 72$ degrees? (Hint: change to radians)

c) In a standard right triangle ACB (right angle at C) what are the measures of the 3 sides if $\alpha = \pi/2$ and $\beta = \pi$.

d) For a general triangle ABC (not necessarily a right triangle), what are the measures of the 3 sides if $\alpha = 2\pi/3$, $\beta = 3\pi/4$, and $\gamma = \pi/5$

e) For a general triangle ABC, find the missing sides and angles if $\alpha = 1$, $a = 1.2$, and $b = .8$.