

DISCUSSION FOR EIGHTH TUTORIAL

DATE: JANUARY 27 AND FEBRUARY 3, 2010

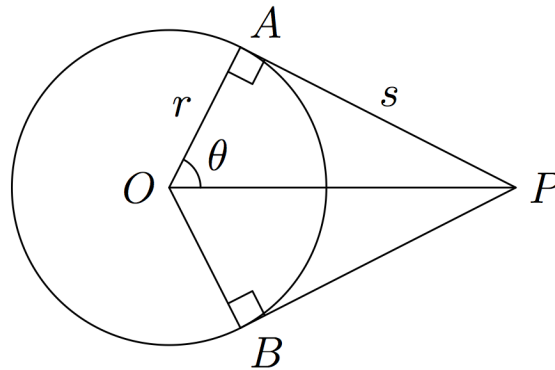
For the problems today we need to know that the radius of the Earth (assuming that it is spherical) is

6378.1 kilometers

We first introduced the following problem which is related to the ‘real’ problem for the tutorial for this week.

If you have a string that fits tightly around the Earth then you add 1 meter to the length of this string. How far off the earth can you lift this string. For instance, is it the width of your finger? Is it far enough off the ground to fit your hand?

(I took this problem off the internet and it is credited there to G. Raymond.) The Earth (assume a perfect sphere with radius $R=6378$ km) is wrapped with a string around the equator. An additional 2π centimeters of string are added to the string. The string is then lifted at a single point until it is taut. Ignore the effects of gravity and assume that the string is unstretchable.



- (1) To what height is the string lifted above the earth at the topmost point (in meters)?
- (2) What is the length of the string not in contact with the earth (in kilometers)?
- (3) What is the area between the earth and the string (in square kilometers)?