Math 124 Writing Up Problem
DUE FRIDAY, OCTOBER 12th

Give a clear and complete write-up answering the question: **How far is it to the horizon?**
Clarification of the question and requirements:

1. Let h = 'eye level height above the ground' and r = 'the radius of the planet'. Make the assumption that the planet is a perfect sphere and that nothing is obscuring your view of the horizon. The horizon is the farthest point on the Earth's surface that you can view from your current location. You are going to find general answers for any planet of radius r and any height h.

2. Your answer must include (simplify formulas/answers as much as possible):

   (a) A two dimensional side-view drawing with the center of the Earth as the origin, 'you' standing on Earth on the y-axis, and the point on the horizon labeled in the first quadrant.

   (b) The general formula for the x and y coordinates on the horizon in terms of h and r

   (c) The general formula for the distance on a straight line from eye level to the horizon in terms of h and r.

   (d) The general formula for the distance along the planet's surface to the horizon in terms of h and r.

   (e) Give numerical values for **both** versions of the distance (in miles) to the horizon using h = 'your height' and r = 'the radius of the Earth'.
   Do the calculations again with h = 'the height of the space needle observation deck' and
   r = 'the radius of the Earth'. (Note: There are 4 numerical values you will give for this part).

   (f) What happens to the point on the horizon and to each distance formula as h goes to infinity (and r is fixed)? Describe in words AND by using algebraic/numerical limit techniques.

   (g) What happens to the horizon point as r goes to infinity (and h is fixed)? Describe in words AND by using algebraic/numerical limit techniques.

   (h) Finish with a brief summary and a discussion of any further questions you personally would like to ask or answer (or discuss real issues that make these theoretical values less accurate).

Here are the guidelines and details for the write-up:

- Start with a paragraph explaining the problem in words along with appropriate labeled drawings. Make it clear how you are defining all variables. Use complete sentences explaining your solution (proper punctuation, capitalization, *etc.*).

- You are allowed, in fact encouraged, to use mathematical notation, functions and equations (don't write these out in words).

- Consider your audience to be your classmates. So write your answer so that any of your classmates would clearly be able to understand what you are doing and would be able to use your explanation as a guide to verify your results.

- The write up should be about 1.5-3 pages (my personal handwritten solution takes about three pages mostly because I've used a lot of spacing and I write big). The goal is to NOT be long-winded. In math, we try to write clear and to the point. We write only what is needed, but we make sure to write enough that each step logically follows from the previous steps.

- The solution to this particular problem will likely have a paragraph or two at the beginning and a paragraph for each major topic along with plenty of algebra and solving (with brief sentences explaining as you go).

- Your solution must be in your own words (please don't make me suspicious of copying).