Calculus I: Quiz Block Assignment 1 Due in Quiz Block Week 3 (September 12th or 13th)

Instructions: For each problem listed below and on the next page, write out the problem number, problem statement and solution making sure to underline or box your final answers. Show all your work just as you would do on a quiz or exam. You will be given feedback on this assignment that will take into account the correctness of both your final answer and your work leading up to your answer. Your neatly written solutions should be stapled and must contain the following information on the front page:

•Your name • Your RIN • Quiz Block Assignment 1

Word Problems and Functions

1. A rectangular bird sanctuary is being created with one side along a straight riverbank. The remaining three sides are to be enclosed with a protective fence. There is a total of 12 kilometers of fencing that is used to form the three sides. We are interested in how the area of the bird sanctuary changes as the dimensions change.

   (a) Draw a picture to illustrate this situation and choose letters for the length variables. Label your picture with these letters.

   (b) Assign a letter to the area of the bird sanctuary and write an equation for the area of the bird sanctuary in terms of the length variables.

   (c) Write an equation that relates the length variables to the available length of fencing of 12 kilometers. (This is sometimes called a constraint equation.)

   (d) Calculations.

      i. If the length of the fence parallel to the river is 5 kilometers, what are the lengths of the other two sides?

      ii. If the length of the fence parallel to the river is 5 kilometers, what is the area of the bird sanctuary.

   (e) Express the area of the bird sanctuary as a function of just one of the length variables. (This function shows how the area of the bird sanctuary changes as the length of one of the sides changes.)

2. A box with square base has a volume of 12 cubic meters. We are interested in how the surface area changes as the dimensions of the box change.

   (a) Draw a picture to illustrate the box and choose letters for the length variables. Label your picture with these letters.

   (b) Assign a letter to the surface area of the box and write an equation to give the surface area of the box in terms of the length variables.

   (c) Write an equation that relates the length variables to the given volume of 12 cubic meters. (This is sometimes called a constraint equation.)

   (d) Calculations.

      i. What are the dimensions of the base of the box if the height is 2 meters?

      ii. What is the surface area of the box when the height is 2 meters?

   (e) Express the surface area of the box as a function of just one of the length variables. (This function shows how the surface area changes as the length of one of the sides changes.)

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3. A box with square base has surface area of 20 square meters. We are interested in how the volume of the box changes as the dimensions change.

   (a) Draw a picture to illustrate the box and choose letters for the length variables. Label your picture with these letters.

   (b) Assign a letter to the volume of the box and write an equation to give the volume of the box in terms of the length variables.

   (c) Write an equation that relates the length variables to the given surface area of 20 square meters. (This is sometimes called a constraint equation.)

   (d) Calculations:

      i. What is the height of the box if the length of one of the sides on the base is 3 meters?

      ii. What is the volume of the box if the length of one of the sides on the base is 3 meters?

   (e) Express the volume of the box as a function of just one of the length variables. (This function shows how the volume changes as the length of one of the sides changes.)