**AP Calculus AB – SHORT ANSWER**

(Due by **Mon 1/4** – to be graded. Show all work, calculations, and explanations)

\*\*You may use your notes, but this must be your OWN work. Do not use the internet \*\*

Do all work on separate paper. Be sure everything is numbered and clearly labeled.

**Calculator ALLOWED for #1-3 only.**

1. The position of an object moving on the x-axis at time t > 0 seconds is feet.
2. Find the average velocity of the object over the interval [1, 3].
3. In what direction and how fast is the object moving at t = 1 second?
4. When is the object moving to the right?
5. Find the position of the object when the velocity is zero.
6. Let W be the first quadrant region enclosed by the graph of and the line x = k.
7. Find the area of W in terms of k.
8. Find the volume of the solid generated when W is rotated about the x-axis in terms of k.
9. What is the volume in part b) as ?
10. The tide removes sand from Shell Island beach at a rate modeled by the function R given by .

To combat this erosion, sand is added to the beach at a rate modeled by the function S, given by

.

Both R(t) and S(t) have units of cubic yards per hour and t is measured in hours for 0 < t < 6. At time t = 0, the beach contains 2500 cubic yards of sand.

1. How much sand will the tide remove from the beach during this 6-hour period? Indicate units of measure.
2. Write an expression for Y(t), the total number of cubic yards of sand on the beach at time t.
3. Find the rate at which the total amount of sand on the beach is changing at time t = 4 hours.
4. For 0 < t < 6, at what time t is the amount of sand on the beach a minimum? What is the minimum value? Justify your answers and show all work.

**NO CALCULATOR for #4:**

1. Consider the differential equation .
2. Find a general solution to the differential equation.
3. Find the particular solution to the differential equation that satisfies the initial condition y(0) = 4.
4. Find the domain and range of the function found in part b).