**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**February 2nd, 2012**

**AP Calculus 1, Mrs. Sulkes**

**Area Under a Curve – Continued…**

Your assignment for today was to find an approximation for the area bounded by the curve , the x-axis, x = 0, and x = 3 using the right endpoint, left endpoint, and midpoint with 3 rectangles of equal width. Today we will find the EXACT area of this region in the plane.

I. Write the sigma formula for the right endpoint to find the area of the 3 rectangles above. (This is the easiest one, so we will use it!)

II. The more rectangles we have in this region, the closer the calculated area is to the actual area. Therefore, we want the number of rectangles to approach infinity. So instead of using n = 3, we now have n = n. The width of each rectangle is no longer , it is the entire interval (3 – 0 = 3) divided by n rectangles . So now write the sigma formula for n rectangles:

III. Next, use formulas to re-write this sum and then find the limit as n approaches infinity. **This is the exact area! (Definition of Area of a Region in the Plane is given on page 301).**

**Practice:**

1. Find the approximate area bounded by  , , and the x-axis by:

1. Using 6 right handed rectangles of equal width. Is this an upper sum or lower sum?
2. Using 6 left handed rectangles of equal width. Is this an upper sum or lower sum?
3. Using 6 midpoint rectangles of equal width.
4. Find the exact area.

2. Given the area bounded by , , , and the axis.

1. Set up the sigma notation for the area if you used n right-handed rectangles.
2. Set up the sigma notation for the area if you used n left-handed rectangles.
3. Set up the sigma notation for the area if you used n midpoint rectangles.
4. Use one of the sigma notations above and find the exact area.

**Assignment: p. 304 #35, 39, 47, 51, 53**