Name: _____ Date: _____

AP Calculus AB: Area Aproximations using Riemann Sums Ms. Loughran

1. (a) Use an appropriate geometric formula to find the exact area A under the line $x + y = 4$ over the interval $[0, 4]$.

(b) Sketch the rectangles for the left endpoint approximation to the area A using $n = 4$ subintervals. Is that approximation greater than, less than, or equal to A? Explain your reasoning, and check your conclusion by calculating the left endpoint approximation.

(c) Sketch the rectangles for the right endpoint approximation to the area A using $n = 4$ subintervals. Is that approximation greater than, less than, or equal to A? Explain your reasoning, and check your conclusion by calculating the right endpoint approximation.

(d) Sketch the rectangles for the midpoint approximation to the area A using $n = 4$ subintervals. Is that approximation greater than, less than, or equal to A? Explain your reasoning, and check your conclusion by calculating the midpoint approximation.

2. Follow the directions of Exercise 1 for the area A under the line $y = 3x$ over the interval $[2, 6]$.

3. Find the left endpoint, right endpoint, and midpoint approximations of the area under the curve $y = x^2 + 1$ over the interval $[0, 5]$ using $n = 5$ subintervals.

4. Find the left endpoint, right endpoint, and midpoint approximations of the area under the curve $y = x^3$ over the interval $[1, 6]$ using $n = 5$ subintervals.

5. Find the left endpoint, right endpoint, and midpoint approximations of the area under the curve $y = \cos x$ over the interval $[-\pi/2, \pi/2]$ using $n = 4$ subintervals.

6. Find the left endpoint, right endpoint, and midpoint approximations of the area under the curve $y = e^x$ over the interval $[0, 5]$ using $n = 5$ subintervals.

7. The accompanying figure shows five points on the graph of an unknown function f. Devise a strategy for using the known points to approximate the area A under the graph of $y = f(x)$ over the interval $[1, 5]$. Describe your strategy, and use it to approximate A.

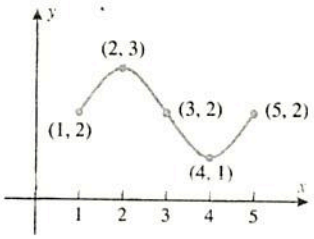

Figure Ex-7

8. (a) Use an appropriate geometric formula to find the exact area A under the line $y = 3x + 1$ over the interval $[1, 5]$.

(b) Show that the exact area is equal to the average value of the left endpoint and right endpoint approximations of A obtained using $n = 4$ subintervals.

What is the explanation of the result in part (b)?