Midpoint and Trapezoid Rule

Example #1:

Use a midpoint Riemann sum to approximate the Area under the curve of $y = e^x$ using 4 subintervals from x=1 to x=3.

- Graph the function.
- Find the midpoint of each subinterval.
- Then solve similar to Left and Right-hand endpoints.

Review: Set up the following:

LRAM:

RRAM:

Solve for MRAM:

- Sometimes on the exam, they will not specify use "left" or use "right" or use "midpoint"

- If a question says to find the area using circumscribed rectangles, then ALL rectangles must be outside of the curve.

- If a question says to find the area using inscribed rectangles, then ALL rectangles must be inside of the curve.

Trapezoid Rule:

Area of Trapezoid:

If I have several trapezoids in a row with the same width:

Formula for Trapezoid Rule:

$$\text{Area} \approx \frac{1}{2}\frac{b-a}{n}[y_0 + 2y_1 + 2y_2 + \cdots + 2y_{n-1} + y_n]$$

where n is the number of subintervals.

Example #2: Use trapezoid rule to find the area from x=-3 to x=0 of $y = 5x^2 \sin(e^x)$ using 3 subintervals.

L'Hopital's Rule

- A method for finding limits.
- When $\lim \frac{f(x)}{g(x)} = \frac{0}{0}\ or\ \frac{\infty}{\infty}$, then

$$\lim \frac{f(x)}{g(x)} = \lim \frac{f'(x)}{g'(x)}$$

Potential Free Response Questions:

Example #1:

$$\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$$

Previous Method: **L'Hopital's:**

Example #2:

$$\lim_{x \to 0} \frac{sin2x}{x}$$

Previous Method: **L'Hopital's:**

Example #3:

$$\lim_{x \to \frac{\pi}{2}} \frac{sin2x}{4x^2 - \pi^2}$$

Potential Multiple Choice Questions:

Example #4:

$$\lim_{x \to 0} \frac{2 - x^2 - 2cosx}{x^4}$$

Example #5:

$$\lim_{x \to \infty} \frac{x^2}{e^x}$$