

## Lab 9

Name \_\_\_\_\_  
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The purpose of lab 10 is to give you practice in using Riemann sums to estimate the value of definite integrals. It also require you to use some of the theoretical concepts we have learned about the definite integral.

1. For each of the definite integrals listed below do the following:

- Graph the function and shade in the area represented by the integral.
- Estimate the area (by hand) using a Riemann sum with  $n = 3$ . Use both right and left hand sums.
- Now estimate the integral using a Riemann sum with  $n = 125$ . Again, use both right and left hand sums.
- Estimate the integral to 5-decimals of accuracy.

i.  $\int_1^3 \ln(x) dx$

ii.  $\int_{\frac{\pi}{6}}^{\pi} \cos(x) dx$

iii.  $\int_{-2}^2 x^3 dx$

iv.  $\int_{-\frac{\pi}{3}}^1 (e^x - \sin(x)) dx$

2. Suppose we know the following facts.  $F(1) = 2$ ,  $F(4) = 6$ ,  $G(1) = -2$ ,  $G(4) = -8$

Find

(a)  $\int_1^4 (F'(x) - G'(x)) dx$

(b)  $\int_1^3 (3F'(x)) dx + \int_3^4 (3F'(x)) dx$

(c)  $\int_4^1 (-1.5F'(x)) dx$

3. Without using Riemann sums find upper and lower bounds for the integral  $\int_0^{2.5} 2e^x \cos(x) dx$ .