

Math 112: Lab 0

Review of sections 5.1-5.4

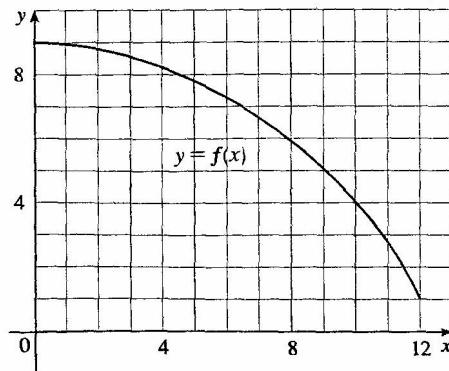
Name _____

In this first lab, you are to review the concepts of integration that you learned at the end of Math 111 or in another course. The problems are taken from sections 5.1-5.4 of *Single Variable Calculus: Early Transcendentals* (5th Edition) by James Stewart. They are reproduced below for your convenience.

Do the problems in the spaces provided, reviewing the material in the book as much as necessary. Turn this lab in to the graduate teaching assistant at your first scheduled lab meeting during the first full week of classes or the deadline set by your instructor. Show all work. Staple the pages together before turning in the work..

1. (Section 5.1)

a) Use six rectangles of find estimates of each type indicated below for the area under the graph of f from $x = 0$ to $x = 12$.



i) L_6 (sample points are left endpoints)

ii) R_6 (sample points are right endpoints)

iii) M_6 (sample points are midpoints)

b) Is L_6 an underestimate or overestimate of the true area? Explain.

c) Which of the numbers L_6 , R_6 , or M_6 gives the best estimate? Explain.

2. (Section 5.1)

The speed of a runner increased steadily during the first three seconds of a race. Her speed at half-second intervals is given in the table. Find lower and upper estimates for the distance that she traveled during these three seconds.

$t(s)$	0	0.5	1.0	1.5	2.0	2.5	3.0
$v(ft/s)$	0	6.2	10.8	14.9	18.1	19.4	20.2

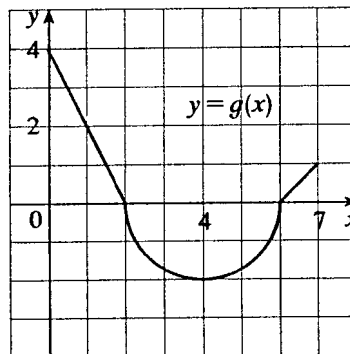
3. (Section 5.2)

Express this limit as a definite integral on the given interval.

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \sqrt{x_i^*} \Delta x \text{ on } [1, 4].$$

4. (Section 5.2)

The graph of g consists of two straight lines and a semicircle. Use it to evaluate each integral.



a) $\int_0^2 g(x) dx$

b) $\int_2^6 g(x) dx$

c) $\int_0^7 g(x) dx$

5. (Section 5.3)

Evaluate the integral $\int_1^{\sqrt{3}} \frac{6}{1+x^2} dx$

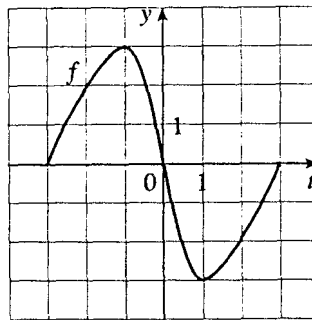
6. (Section 5.3)

Evaluate the integral $\int_{-e^2}^{-e} \frac{3}{x} dx$

7. (Section 5.4) $\int_1^8 \left(\sqrt[3]{r} + \frac{1}{\sqrt[3]{r}} \right) dr$

8. (Section 5.3)

Let $g(x) = \int_{-3}^x f(t) dt$, where f is the function whose graph is shown.



a) Evaluate $g(-3)$ and $g(3)$.

b) Estimate $g(-2)$, $g(-1)$, and $g(0)$.

c) On what interval is g increasing?

d) Where does g have a maximum value?

e) Sketch a rough graph of g on the same axes as f . Label it g .

f) Use the graph in part (e) to sketch the graph of $g'(x)$ on the same set of axes. Label it $g'(x)$

9. (Section 5.4)

Evaluate the integral: $\int_1^2 \frac{t^6 - t^2}{t^4} dt$.

10. True or false? Explain.

a) All continuous functions have derivatives.

b) All continuous functions have antiderivatives.