

Graded Homework Set 5 -- Calculus I -- Math 191 (Page references in red)
(For problems 1, 2, and 3 see section 5.1)

1. a. Evaluate the Riemann Sum for an estimate of the area under the curve $y = f(x) = x^3 + 1$ from $x = 0$ to $x = 3$, using 3 approximating rectangles and left endpoints.

b. Sketch the graph and rectangles for the above function. Is your estimate an over or under estimate?

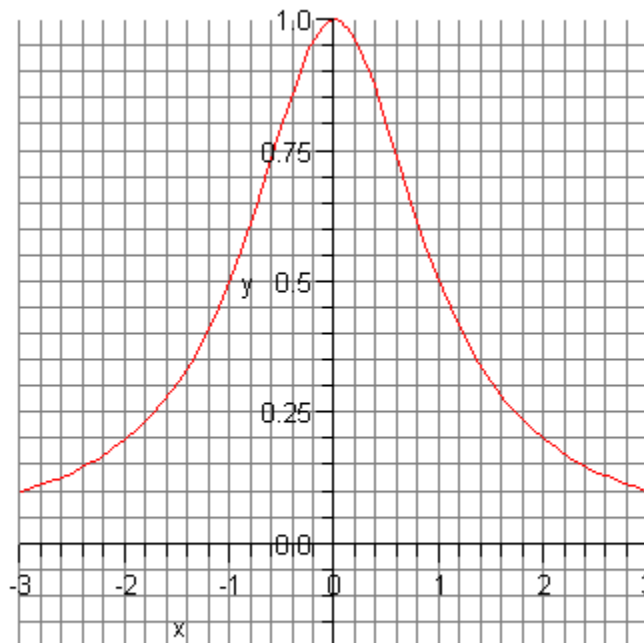
2. Speedometer readings for a motorcycle at 12-second intervals are shown in the table below: (See example 4 page 296)

Time in seconds	0	12	24	36	48	60
Velocity in ft/sec	30	28	25	22	24	27

a. Estimate the distance traveled by the motorcycle during this time period using the velocities at the beginning of the time interval.

b. Estimate the distance traveled by the motorcycle during this time period using the velocities at the end of the time period.

3. Given the function sketched below, estimate the area under the graph of this function from $x = -2$ to $x = 2$ using 4 approximating rectangles with right endpoints.



4. a. Express $\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{1}{x_i} \Delta x$ as a definite integral from $x = 1$ to $x = 5$.

(See page 300)

b. If $\int \frac{1}{x} dx = \log_e x = \ln x$, evaluate $\int_1^5 \frac{1}{x} dx$ using the fundamental theorem of calculus.

(See page 318)

c. Use the fundamental theorem of calculus to evaluate $\int_{-3}^2 x^2 dx$.

(See page 318)

5. Use Part I of the fundamental theorem of calculus to evaluate:

(See page 320)

a. $g'(x)$ if $g(x) = \int_{t=1}^{t=x} (2+t)^5 dt$

b. $g'(x)$ if $g(x) = \int_{t=0}^{t=x} \sqrt{1+t^3} dt$

6. Evaluate: (See section 5.4)

a. $\int_1^3 (1+2x-4x^3) dx$

b. $\int_0^\pi \sin(x) dx$

c. $\int_0^{\frac{\pi}{4}} \sec^2 x dx$

7. a. Water flows from the bottom of a storage tank at a rate of $r(t) = 200 - 4t$ liters per minute where $0 \leq t \leq 50$. If the tank is completely drained, how much water was in the tank to begin with? (See section 5.4)

b. If oil leaks from a tank at the rate of $r(t)$ gallons per second at time t , what does $\int_0^{120} r(t) dt$ represent? (See section 5.4)

8. Evaluate the following integrals using the substitution rule (Show your work and the substitution made)

a. $\int (3x - 2)^{20} dx$

b. $\int \frac{x}{(x^2 + 1)^2} dx$

c. $\int (\sin x)^{15} \cos x dx$