

Review for Midterm I¹

Here are a list of things you need to know:

1. antiderivatives (indefinite integrals); table on p. 402;
2. Riemann sum; approximation of integrals with left and right endpoints and midpoints;
3. fundamental theorem of calculus (including total change theorem);
4. substitution rule.

A Practice Midterm

1. (20 points) A particle is moving along a line so that its velocity is given by

$$v(t) = 4t^3 - 4$$

where t is measured in seconds and $v(t)$ is measured in meters per second. Let $s(t)$ be the position function of the particle and $s(0) = 1$.

- (a) (5 points) Find the coordinate of the particle after 3 seconds.
 - (b) (5 points) Find the coordinate of the particle after 10 seconds.
 - (c) (10 points) Find the coordinate of the particle after t seconds.
2. (20 points) The following table gives the value of a function $f(x)$ obtained from an experiment.

x	0	1	2	3	4	5	6
$f(x)$	0	1	4	9	16	25	36

¹<http://www.math.ucsb.edu/~xichen/math3b02w/p1.pdf>

Estimate $\int_0^6 f(x)dx$ using three equal intervals with (a) right endpoints (b) left endpoints (c) midpoints. If $f(x)$ is known to be an increasing function on $[0, 6]$, can you say whether your estimates are less than or greater than the exact value of the integral.

3. (20 points)

(a) (10 points) Let $f(t) = \int_0^t e^{x^2} dx$. Find $f'(t)$.

(b) (10 points) Let $f(t) = \int_0^{t^2} e^{x^2} dx$. Find $f'(t)$.

4. (40 points) Evaluate the following integrals.

(a) (10 points) $\int_1^2 \frac{(1+x)^3}{x} dx$

(b) (10 points) $\int_1^2 x\sqrt{x^2+1} dx$

(c) (10 points) $\int \frac{1+x}{1+x^2} dx$

(d) (10 points) $\int \frac{e^x}{1+e^x} dx$