

AB Calculus
Chapter 6 Review

1) If the second derivative of f is given by $f''(x) = 2x - \cos x$, which of the following could be $f(x)$?

(A) $\frac{x^3}{3} + \cos x - x + 1$

1993 AB 38
Calc

(B) $\frac{x^3}{3} - \cos x - x + 1$

(C) $x^3 + \cos x - x + 1$

(D) $x^2 - \sin x + 1$

(E) $x^2 + \sin x + 1$

2) $\int \frac{5}{1+x^2} dx =$

1973 AB 32

(A) $\frac{-10x}{(1+x^2)^2} + C$

(B) $\frac{5}{2x} \ln(1+x^2) + C$

(C) $5x - \frac{5}{x} + C$

(D) $5 \arctan x + C$

(E) $5 \ln(1+x^2) + C$

3) $\int_1^2 \frac{1}{x^2} dx =$ 1998 AB 3

- (A) $-\frac{1}{2}$ (B) $\frac{7}{24}$ (C) $\frac{1}{2}$ (D) 1 (E) $2 \ln 2$

4) $\int_1^{500} (13^x - 11^x) dx + \int_2^{500} (11^x - 13^x) dx =$ 1993 AB 28
Calc

- (A) 0.000 (B) 14.946 (C) 34.415 (D) 46.000 (E) 136.364
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5) A particle with velocity at any time t given by $v(t) = e^t$ moves in a straight line. How far does the particle move from $t = 0$ to $t = 2$? 1988 AB 3

- (A) $e^2 - 1$ (B) $e - 1$ (C) $2e$ (D) e^2 (E) $\frac{e^3}{3}$
-

6)

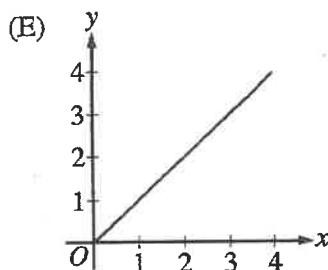
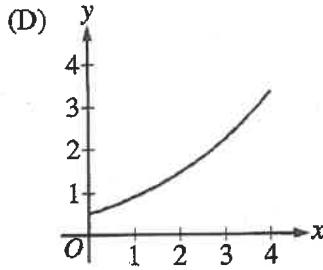
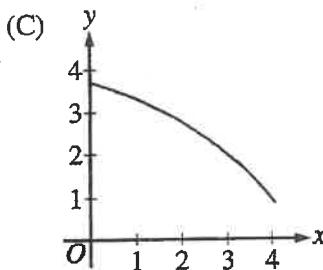
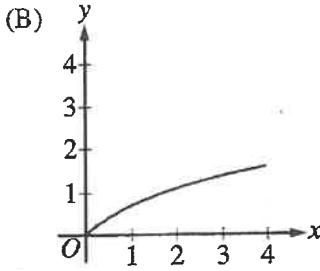
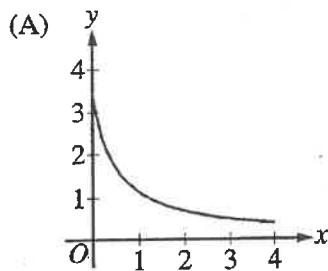
The velocity of a particle moving on a line at time t is $v = 3t^{\frac{1}{2}} + 5t^{\frac{3}{2}}$ meters per second. How many meters did the particle travel from $t = 0$ to $t = 4$?

- (A) 32 (B) 40 (C) 64 (D) 80 (E) 184

1985 AB 14

7)

If a trapezoidal sum overapproximates $\int_0^4 f(x) dx$, and a right Riemann sum underapproximates $\int_0^4 f(x) dx$, which of the following could be the graph of $y = f(x)$?



2003 AB 85 Calc

8) If the definite integral $\int_0^2 e^{x^2} dx$ is first approximated by using two inscribed rectangles of equal width and then approximated by using the trapezoidal rule with $n = 2$, the difference between the two approximations is

- (A) 53.60 (B) 30.51 (C) 27.80 (D) 26.80 (E) 12.78

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9) The velocity, in ft/sec, of a particle moving along the x -axis is given by the function $v(t) = e^t + te^t$. What is the average velocity of the particle from time $t = 0$ to time $t = 3$?

- (A) 20.086 ft/sec
(B) 26.447 ft/sec
(C) 32.809 ft/sec
(D) 40.671 ft/sec
(E) 79.342 ft/sec

2003 AB 83
Calc

10) What is the average value of $y = \frac{\cos x}{x^2 + x + 2}$ on the closed interval $[-1, 3]$?

2008 AB 91

Calc

- (A) -0.085 (B) 0.090 (C) 0.183 (D) 0.244 (E) 0.732

11)

x	2	5	7	8
$f(x)$	10	30	40	20

The function f is continuous on the closed interval $[2, 8]$ and has values that are given in the table above. Using the subintervals $[2, 5]$, $[5, 7]$, and $[7, 8]$, what is the trapezoidal approximation of

$$\int_2^8 f(x) dx?$$

- (A) 110 (B) 130 (C) 160 (D) 190 (E) 210

12)

Let f be a continuous function on the closed interval $[0, 2]$. If $2 \leq f(x) \leq 4$, then the greatest possible value of $\int_0^2 f(x) dx$ is

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AB 40

- (A) 0 (B) 2 (C) 4 (D) 8 (E) 16

13)

Let f and g have continuous first and second derivatives everywhere. If $f(x) \leq g(x)$ for all real x , which of the following must be true?

1985 AB 38

- I. $f'(x) \leq g'(x)$ for all real x
- II. $f''(x) \leq g''(x)$ for all real x
- III. $\int_0^1 f(x) dx \leq \int_0^1 g(x) dx$

- (A) None (B) I only (C) III only (D) I and II only (E) I, II, and III

14) If $\int_a^b f(x) dx = a + 2b$, then $\int_a^b (f(x) + 5) dx =$

1997 AB 3

-
- (A) $a + 2b + 5$ (B) $5b - 5a$ (C) $7b - 4a$ (D) $7b - 5a$ (E) $7b - 6a$

15) If $\int_1^{10} f(x) dx = 4$ and $\int_{10}^3 f(x) dx = 7$, then $\int_1^3 f(x) dx =$

1988 AB 39

- (A) -3 (B) 0 (C) 3 (D) 10 (E) 11
-

16) $\int_1^4 |x-3| dx =$ 1988 AB 28

- (A) $-\frac{3}{2}$ (B) $\frac{3}{2}$ (C) $\frac{5}{2}$ (D) $\frac{9}{2}$ (E) 5
-

17) If $\int_{-1}^1 e^{-x^2} dx = k$, then $\int_{-1}^0 e^{-x^2} dx =$ 1985 AB 9

-
- (A) $-2k$ (B) $-k$ (C) $-\frac{k}{2}$ (D) $\frac{k}{2}$ (E) $2k$
-

18) $\frac{d}{dx} \int_0^x \cos(2\pi u) du$ is

1993 AB 41 calc

- (A) 0 (B) $\frac{1}{2\pi} \sin x$ (C) $\frac{1}{2\pi} \cos(2\pi x)$ (D) $\cos(2\pi x)$ (E) $2\pi \cos(2\pi x)$
-

19) If $F(x) = \int_0^x \sqrt{t^3 + 1} dt$, then $F'(2) =$

1998 AB 15

- (A) -3 (B) -2 (C) 2 (D) 3 (E) 18
-

20) $\frac{d}{dx} \left(\int_0^{x^2} \sin(t^3) dt \right) =$

2003 AB 23

- (A) $-\cos(x^6)$ (B) $\sin(x^3)$ (C) $\sin(x^6)$ (D) $2x \sin(x^3)$ (E) $2x \sin(x^6)$

Basic Integration Problems

I. Find the following integrals.

$$1. \int (5x^2 - 8x + 5)dx$$

$$2. \int (-6x^3 + 9x^2 + 4x - 3)dx$$

$$3. \int (x^{\frac{3}{2}} + 2x + 3)dx$$

$$4. \int \left(\frac{8}{x} - \frac{5}{x^2} + \frac{6}{x^3} \right) dx$$

$$5. \int (\sqrt{x} + \frac{1}{3\sqrt{x}})dx$$

$$6. \int (12x^{\frac{3}{4}} - 9x^{\frac{5}{3}})dx$$

$$7. \int \frac{x^2 + 4}{x^2} dx$$

$$8. \int \frac{1}{x\sqrt{x}} dx$$

$$9. \int (1 + 3t)t^2 dt$$

$$10. \int (2t^2 - 1)^2 dt$$

$$11. \int y^2 \sqrt[3]{y} dy$$

$$12. \int d\theta$$

$$13. \int 7 \sin(x)dx$$

$$14. \int 5 \cos(\theta)d\theta$$

$$15. \int 9 \sin(3x)dx$$

$$16. \int 12 \cos(4\theta)d\theta$$

$$17. \int 7 \cos(5x)dx$$

$$18. \int 4 \sin\left(\frac{x}{3}\right)dx$$

$$19. \int 4e^{-7x}dx$$

$$20. \int 9e^{\frac{x}{4}}dx$$

$$21. \int -5 \cos \pi x dx$$

$$22. \int -13e^{6t}dt$$

II. Evaluate the following definite integrals.

$$1. \int_1^4 (5x^2 - 8x + 5)dx$$

$$2. \int_1^9 (x^{\frac{3}{2}} + 2x + 3)dx$$

$$3. \int_4^9 (\sqrt{x} + \frac{1}{3\sqrt{x}})dx$$

$$4. \int_1^4 \frac{5}{x^3} dx$$

$$5. \int_{-1}^2 (1 + 3t)t^2 dt$$

$$6. \int_{-2}^1 (2t^2 - 1)^2 dt$$

Riemann Sum Extra Practice

The rate that people are entering a local office is given below in people/hour. Use the table to answer questions 1-3.

Time (hours)	0	1	3	4	7
$r'(t)$ ppl/hr	12	7	3	5	8

1. Use a left Riemann sum with 4 subintervals to approximate the total number of people entering the office over the interval $0 \leq t \leq 7$.
2. Use a right Riemann sum with 4 subintervals to approximate the total number of people entering the office over the interval $0 \leq t \leq 7$.
3. Use a trapezoidal approximation with 4 subintervals to approximate the total number of people entering the office over the interval $0 \leq t \leq 7$.

Gasoline is being pumped into a car. The rate that the gas is being pumped is given in the table below at selected times (seconds). Use the table to answer questions 4-6.

Time (sec)	0	4	8	12	16	20	24
$g'(t)$ gal/sec	0	.34	.42	.56	.45	.34	.22

4. Use a right Riemann Sum with 3 subintervals to approximate the total gallons of gasoline pumped in the car over the 24 seconds.
 5. Use a midpoint Riemann Sum with 3 subintervals to approximate the total gallons of gasoline pumped in the car over the 24 seconds.
 6. Use a left Riemann Sum approximation with 3 subintervals to approximate the total gallons of gasoline pumped in the car over the 24 seconds.

7.

List, from smallest to largest:

(i) $h'(5)$

(ii) the average rate of change of h over the interval $[0,10]$

(iii) $\int_0^{10} h(x)dx$

(iv) $\int_0^5 h(x)dx$

(v) $\int_6^{10} h(x)dx$

(vi) $\int_5^6 h(x)dx$

Graph of h

