

1985 AB

1. $\int_1^2 x^{-3} dx =$

- (A) $-\frac{7}{8}$ (B) $-\frac{3}{4}$ (C) $\frac{15}{64}$ (D) $\frac{3}{8}$ (E) $\frac{15}{16}$

4. If $\frac{dy}{dx} = \cos(2x)$, then $y =$

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

9. If $\int_{-1}^1 e^{-x^2} dx = k$, then $\int_{-1}^0 e^{-x^2} dx =$

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

14. 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

22. $\int_1^2 \frac{x^2 - 1}{x + 1} dx =$

- (A) $\frac{1}{2}$ (B) 1 (C) 2 (D) $\frac{5}{2}$ (E) $\ln 3$

24. If $\int_{-2}^2 (x^7 + k) dx = 16$, then $k =$

- (A) -12 (B) -4 (C) 0 (D) 4 (E) 12

27. $\int_0^3 |x-1| dx =$

- (A) 0 (B) $\frac{3}{2}$ (C) 2 (D) $\frac{5}{2}$ (E) 6

30. $\int \tan(2x) dx =$

- (A) $-2 \ln |\cos(2x)| + C$ (B) $-\frac{1}{2} \ln |\cos(2x)| + C$ (C) $\frac{1}{2} \ln |\cos(2x)| + C$
(D) $2 \ln |\cos(2x)| + C$ (E) $\frac{1}{2} \sec(2x) \tan(2x) + C$

32. $\int_0^{\frac{\pi}{3}} \sin(3x) dx =$

- (A) -2 (B) $-\frac{2}{3}$ (C) 0 (D) $\frac{2}{3}$ (E) 2

38. 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?

- 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

40. 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

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

42. $\frac{d}{dx} \int_2^x \sqrt{1+t^2} dt =$

- (A) $\frac{x}{\sqrt{1+x^2}}$ (B) $\sqrt{1+x^2} - 5$ (C) $\sqrt{1+x^2}$
(D) $\frac{x}{\sqrt{1+x^2}} - \frac{1}{\sqrt{5}}$ (E) $\frac{1}{2\sqrt{1+x^2}} - \frac{1}{2\sqrt{5}}$

44. The average value of $f(x) = x^2\sqrt{x^3+1}$ on the closed interval $[0, 2]$ is

- (A) $\frac{26}{9}$ (B) $\frac{13}{3}$ (C) $\frac{26}{3}$ (D) 13 (E) 26

1985 BC

1. The area of the region between the graph of $y = 4x^3 + 2$ and the x -axis from $x = 1$ to $x = 2$ is

- (A) 36 (B) 23 (C) 20 (D) 17 (E) 9

3. $\int_1^2 \frac{x+1}{x^2+2x} dx =$

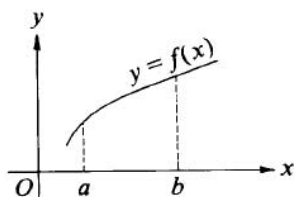
- (A) $\ln 8 - \ln 3$ (B) $\frac{\ln 8 - \ln 3}{2}$ (C) $\ln 8$ (D) $\frac{3 \ln 2}{2}$ (E) $\frac{3 \ln 2 + 2}{2}$

7. Which of the following is equal to $\int \frac{1}{\sqrt{25-x^2}} dx$?

- (A) $\arcsin \frac{x}{5} + C$ (B) $\arcsin x + C$ (C) $\frac{1}{5} \arcsin \frac{x}{5} + C$
(D) $\sqrt{25-x^2} + C$ (E) $2\sqrt{25-x^2} + C$

15. If the velocity of a particle moving along the x -axis is $v(t) = 2t - 4$ and if at $t = 0$ its position is 4, then at any time t its position $x(t)$ is

- (A) $t^2 - 4t$ (B) $t^2 - 4t - 4$ (C) $t^2 - 4t + 4$ (D) $2t^2 - 4t$ (E) $2t^2 - 4t + 4$



27. If f is the continuous, strictly increasing function on the interval $a \leq x \leq b$ as shown above, which of the following must be true?

- I. $\int_a^b f(x) dx < f(b)(b-a)$
II. $\int_a^b f(x) dx > f(a)(b-a)$
III. $\int_a^b f(x) dx = f(c)(b-a)$ for some number c such that $a < c < b$
- (A) I only (B) II only (C) III only (D) I and III only (E) I, II, and III

28. An antiderivative of $f(x) = e^{x+e^x}$ is

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

36. $\int_{-1}^1 \frac{3}{x^2} dx$ is

- (A) -6 (B) -3 (C) 0 (D) 6 (E) nonexistent

40. If the substitution $u = \frac{x}{2}$ is made, the integral $\int_2^4 \frac{1 - \left(\frac{x}{2}\right)^2}{x} dx =$

- (A) $\int_1^2 \frac{1-u^2}{u} du$ (B) $\int_2^4 \frac{1-u^2}{u} du$ (C) $\int_1^2 \frac{1-u^2}{2u} du$
(D) $\int_1^2 \frac{1-u^2}{4u} du$ (E) $\int_2^4 \frac{1-u^2}{2u} du$