

NOTA stands for None Of The Above

1. Find

$$\int 3x^2 dx$$

- A. $3x^3$ B. x^3 C. $x^3/3$ D. $2x^3$ E. NOTA

2. What is the area under the curve $f(x) = e^x$ from $x = -10$ to $x = 10$.

- A. $e^{10} - e^{-10}$ B. $e^{10} + e^{-10}$ C. e^{10} D. $e^{10} - 10$ E. NOTA

3. Consider a bottle of Mr. Macfarlane's favorite Tabasco sauce constructed by rotating the region bound by $y = 2x^3$, $y = 54$, and $x = 0$ around the y-axis. Find the volume of Tabasco sauce that can fit inside the bottle.

- A. $\frac{1458\pi}{5}$ B. $\frac{81\pi}{2}$ C. $\frac{972\pi}{5}$ D. 81π E. NOTA

4. What is the average value of $f(x) = x^3$ over the interval $[-3, 3]$?

- A. 9 B. $81/4$ C. $27/8$ D. 0 E. NOTA

5. Find

$$\frac{d}{dx} \int_0^{1/x} \frac{t^2 + \sin \pi t}{1-t} dt$$

- A. $\frac{\frac{1}{x^2} + \sin \frac{\pi}{x}}{1 - \frac{1}{x}}$ B. $\frac{\frac{1}{x^2} + \sin \frac{\pi}{x}}{x^2 - x}$ C. $-\frac{\frac{1}{x^2} + \sin \frac{\pi}{x}}{1 - \frac{1}{x}}$ D. $-\frac{\frac{1}{x^2} + \sin \frac{\pi}{x}}{x^2 - x}$

E. NOTA

6. A particle that travels along the x-axis at time of t seconds has a velocity of $v(t) = \frac{2}{t} - 1$.

What is the total distance it travels over the time interval $[1, 4]$?

- A. 1 B. 2 C. $4 \ln 2 - 3$ D. $2 \ln 2 - 3$ E. NOTA

7. Evaluate

$$\int_{\pi/4}^{\pi/2} \csc x \cot x \, dx$$

- A. $\sqrt{2} - 1$ B. $1 - \sqrt{2}$ C. 1 D. -1 E. NOTA

8. Find the area bounded by the polar equation $r = 2 \sin \theta$.

- A. $\pi/4$ B. π C. 2π D. 4π E. NOTA

9. Find

$$\int_1^9 e^{\sqrt{x}} \, dx$$

- A. $2e^3$ B. $4e^3$ C. $8e^3$ D. $16e^3$ E. NOTA

10. Using Simpson's Rule, approximate the area under the curve $f(x) = x^3 + 1$ from $x = 0$ to $x = 5$ with 5 equal subintervals.

- A. 151.25 B. 156.25 C. 161.25 D. 166.25 E. NOTA

11. Evaluate

$$\int_0^{\infty} \sin x \, dx$$

- A. -2 B. 0 C. 2 D. π E. NOTA

12. Find the volume of the solid formed by rotating the region bound by $f(x) = x^{2011}$, $x = 1$ and $y = 0$ around the y-axis.

- A. $1/2012$ B. $1/2013$ C. $2\pi/2013$ D. $\pi/2012$ E. NOTA

13. Evaluate

$$\int_0^3 \frac{2x}{x^2 - 1} \, dx$$

- A. $2 \ln 3$ B. $3 \ln 2$ C. $2 \ln 2$ D. $3 \ln 3$ E. NOTA

14. Solve the differential equation: $\ln x - \frac{dy}{dx} = 2x - 1$

- A. $y = x \ln x - 2x + 1 + C$ B. $y = x \ln x - x^2 + C$ C. $y = x \ln x + 1 + C$
 D. $y = x \ln x - 1 + C$ E. NOTA

15. Evaluate

$$\int_{-\frac{\pi}{6}}^{\frac{\pi}{12}} \tan 2x \, dx$$

- A. $-\frac{\ln 3}{4}$ B. $\frac{\ln 3}{4}$ C. $-\frac{\ln 3}{2}$ D. $\frac{\ln 3}{2}$ E. NOTA

16. Find the x-coordinate of the centroid of the region bounded in the first quadrant between the curves $f(x) = \ln x$ and $f(x) = \ln(3 - x)$.

- A. $3/2$ B. $5/4$ C. 2 D. $7/3$ E. NOTA

17. Evaluate

$$\lim_{n \rightarrow \infty} \sum_{i=0}^n \frac{2n}{n^2 + i^2}$$

- A. $\pi/4$ B. $\pi/2$ C. π D. $\ln 2$ E. NOTA

18. In the fourth quadrant, what is the probability that a point chosen at random above the curve $f(x) = x^3 - 9x$ and under the x axis is also above the line $g(x) = -8x$?

- A. $1/81$ B. $4/27$ C. $80/81$ D. $23/27$ E. NOTA

19. Evaluate

$$\int e^x \cos x \, dx$$

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

20. Find the volume of a solid that is bounded by the graph, $f(x) = \frac{1}{2}x^2$, $x = 4$, and $y = 0$, and whose cross sections are equilateral triangles, perpendicular to the x-axis.

- A. $\frac{128\sqrt{3}}{5}$ B. $\frac{64\sqrt{3}}{5}$ C. $\frac{32\sqrt{3}}{5}$ D. $\frac{16\sqrt{3}}{5}$ E. NOTA

21. Find the volume of a solid that is bounded by the graph, $f(x) = \frac{1}{2}x^2$ and $y = 8$, and whose cross sections are equilateral triangles, perpendicular to the y-axis.

- A. $128\sqrt{3}$ B. $64\sqrt{3}$ C. $32\sqrt{3}$ D. $16\sqrt{3}$ E. NOTA

22.

$$\int_{11}^{4\sqrt{3}+5} \frac{dx}{(x-5)\sqrt{x^2-10x-11}}$$

- A. $\pi/36$ B. $\pi/18$ C. $\pi/9$ D. $2\pi/9$ E. NOTA

23. Evaluate the sum as $n \rightarrow \infty$.

$$\frac{1}{n} + \frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \cdots + \frac{1}{2n}$$

- A. $\frac{\ln 2}{2}$ B. $\ln 2$ C. $2 \ln 2$ D. 1 E. NOTA

24. Evaluate. (Hint: Wallis)

$$\int_0^{\frac{\pi}{2}} \cos^7 x \, dx$$

- A. $3/8$ B. $5/16$ C. $8/15$ D. $16/35$ E. NOTA

25. Find the area in one petal of $r = \pi \cos 3\theta$.

- A. $\pi^2/6$ B. $\pi^2/12$ C. $\pi^2/24$ D. $\pi^3/6$ E. NOTA

26. Evaluate

$$\int_0^5 x^3 e^{x^2} dx$$

- A. $24e^{25}$ B. $12e^{25}$ C. $24e^{25} + 1$ D. $12e^{25} + \frac{1}{2}$ E. NOTA

27. The following summation is equivalent to which of the following integrals?

$$\lim_{n \rightarrow \infty} \sum_{i=0}^n \frac{5 \left(3 \left(2 + \frac{5i}{n} \right)^2 + 2 + \frac{5i}{n} \right)^2}{5i + 3n}$$

- A. $\int_5^7 \frac{(3x^2+x)^2}{x+1} dx$ B. $\int_0^5 \frac{(3x^2+x)^2}{x+1} dx$ C. $\int_2^5 \frac{(3x^2+x)^2}{x+1} dx$ D. $\int_2^7 \frac{(3x^2+x)^2}{x+1} dx$

E. NOTA

28.

$$\int_0^{\pi/4} \sec^6 x \tan^4 x dx$$

- A. $26/35$ B. $188/315$ C. $32/35$ D. $164/315$ E. NOTA

29. Find $\int_0^4 g(x) dx$ if $f(x) = x^2 - 4x + 3$ if $g(x) = f^{-1}(x)$ for $x > 2$.

- A. $\frac{22}{3} + \frac{5\sqrt{5}}{2}$ B. $\frac{26}{3} + \frac{5\sqrt{5}}{2}$ C. $\frac{22}{3} + \frac{10\sqrt{5}}{3}$ D. $\frac{26}{3} + \frac{10\sqrt{5}}{3}$ E. NOTA

30. Evaluate

$$\int_{-1/2}^1 \frac{x}{4x^2 + 4x + 10} dx$$

- A. $\frac{\pi}{4} + 6\sqrt{2}$ B. $\frac{\sqrt{3}}{4} + \frac{2\ln 2}{3}$ C. $\frac{\ln 2}{8} - \frac{\pi}{48}$ D. $\frac{\pi\sqrt{3}}{2} - \ln 2$ E. NOTA