

If none of the answers given is correct choose e) NOTA.

1. $\int (\sin(x) + e^{3x}) dx$

- a) $\cos(x) + \frac{e^{3x}}{3} + C$ b) $\frac{-\cos(x) + e^{3x}}{3} + C$
 c) $\frac{\cos(x) + e^{3x}}{3} + C$ d) $-\cos(x) + \frac{e^{3x}}{3} + C$
 e) NOTA

2. Which of the following functions has the fastest rate of growth as $x \rightarrow \infty$?

- a) $y = 5^{x+1}$ b) $y = 100x^{18}$
 c) $y = \log_2(100x)$ d) $y = e^{2x}$ e) NOTA

3. Find the slope of the tangent line to $e^{xy} + 3y = 5$ at $x = 0$.

- a) -4 b) $-\frac{4}{9}$ c) 0 d) $\frac{11}{9}$ e) NOTA

4. Use the trapezoidal rule with $n = 4$ to approximate the area between the curve $y = \sin(0.5x)$ and the x-axis over $[1,5]$ to the nearest thousandth.

- a) 1.913 b) 3.287
 c) 3.826 d) 6.574 e) NOTA

5. $f(x) = \begin{cases} x^2 + 1, & x > 2 \\ 4x, & x \leq 2 \end{cases}$ $g(x) = \ln(x^2 - 4)$

Which of the following are continuous at $x = 2$?

- a) $f'(x)$ b) $g(x)$
 c) $\int_0^x f(t) dt$ d) $g(f(x))$ e) NOTA

6. Let R be the region bounded by the graphs of $x = y^2$ and $x = 16$. Find the volume of the solid that has R as its base if every cross section by a plane perpendicular to the x-axis is a parallelogram with its base in the xy plane and height equal to twice the length of the base.

- a) $\frac{1024}{3}$ b) 128
 c) 1024 d) 3072 e) NOTA

7. $\int \frac{\cos(x)\sin(x)}{\cos^2(x) - 1} dx =$

- a) $\csc^2(x) + C$ b) $-\ln|\csc(x)| + C$
 c) $\csc(x)\cot(x) + C$ d) $-\cot(x) + C$
 e) NOTA

8. Find the maximum value of $y = 6\ln(x) - \frac{x}{4}$ to the nearest thousandth.

- a) -25.068 b) 2.134
 c) 8.309 d) 13.068 e) NOTA

9. An isosceles triangle has equal sides of length 10 inches. If the angle θ between these sides is increased from 30° to 33° use differentials to approximate the change in the area of the triangle to the nearest thousandth.

- a) 1.214 b) 2.267
 c) 3.206 d) 129.904 e) NOTA

10. A particle moves along a line so that its velocity at time t is $v(t) = t^2 - t - 6$. Find the displacement of the particle during the time period $1 \leq t \leq 3$.

- a) $-\frac{21}{2}$ b) $-\frac{22}{3}$ c) -5 d) $\frac{11}{3}$ e) NOTA

11. A cone of radius 3 cm and height of 10 cm is lowered point first at a rate of 1 cm/s into a tall cylinder of radius R cm that is partially filled with water. The entire cone fits in the cylinder with no spillage occurring. How fast is the water level rising in cm/s the instant the cone is completely submerged.

- a) $\frac{9}{R^2}$ b) $\frac{9-2R}{R}$
 c) $\frac{27}{2R}$ d) $\frac{3-2R}{R}$ e) NOTA

12. Find the volume of the solid obtained by rotating the region bounded by $y = x^3$, $y = 8$, and $x = 0$ about the y -axis.

- a) $\frac{32\pi}{5}$ b) $\frac{48\pi}{5}$
 c) $\frac{64\pi}{5}$ d) $\frac{96\pi}{5}$ e) NOTA

13. What is the total number of asymptotes of the graph of $f(x) = \frac{\sqrt{4x^2 + 1}}{(x-1)^2}$?

- a) 1 b) 2 c) 3 d) 4 e) NOTA

14. Write the equation of the tangent line to $y = \tan(\tan(\tan(2x)))$ at $x = 0$.

- a) $y = 0$ b) $x - y = 0$
 c) $2x - y = 0$ d) $8x - y = 0$ e) NOTA

15. $\frac{dy}{dx} = \frac{\tan(x)}{y}$, $y > 0$. If $y(2\pi) = 2$, find $y(1)$ to the nearest thousandth.

- a) 1.110 b) 2.287
 c) 3.702 d) 5.231 e) NOTA

16. Find the sum of the x -coordinates of the point(s) of inflections for $f(x) = \frac{x^2}{4} + \cos(x)$, $0 \leq x \leq 4\pi$.

- a) π b) 2π c) 6π d) 8π e) NOTA

17. Given the following table of values find $\frac{d}{dx}[f^2(g(x))]$ at $x = 0$.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	1	1	2	3
1	2	-5	-0.5	3.5

- a) -6 b) -3 c) -2 d) -1 e) NOTA

18. Find the linearization at $x = 2$ of

$$f(x) = 2 + \int_4^{x^2} (t^2 + 3t - 8) dt$$

- a) $80x - y = 158$ b) $20x - y = 38$
 c) $82x - y = 162$ d) $8x - y = 14$
 e) NOTA

19. $\int_1^8 f(x) dx = -2$, $\int_1^3 f(x) dx = 3$, and $\int_3^8 g(x) dx = 5$. Find $\int_1^3 [f(x) - g(x)] dx$.

- a) -6 b) 0 c) 6 d) 10 e) NOTA

20. Find the area enclosed by $x = y^2$ and $x = y + 2$.

- a) $\frac{13}{6}$ b) $\frac{10}{3}$ c) 4 d) $\frac{9}{2}$ e) NOTA

21. Find ab if $\lim_{x \rightarrow 0} \frac{\sin(ax) + bx}{x^3} = \frac{-32}{3}$.

- a) -16 b) -4 c) 0 d) 8 e) NOTA

22. Oil is leaking from a tanker at the rate of $R(t) = 300(2^{-0.3t})$ gallons per hour, where t is measured in hours. To the nearest gallon how much oil has leaked out after 10 hours?

- a) 1156 b) 1262
c) 2100 d) 3030 e) NOTA

23. Find the maximum distance measured horizontally between the graphs of $f(x) = x$ and $g(x) = x^2$, $0 \leq x \leq 1$.

- a) $\frac{1}{8}$ b) $\frac{1}{3}$ c) $\frac{1}{4}$ d) $\frac{1}{2}$ e) NOTA

24. $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \frac{\sec^2(x)}{\tan(x)} dx =$

- a) $\ln\sqrt{3}$ b) $-\ln\sqrt{3}$
c) $\ln\sqrt{2}$ d) $\sqrt{3} - 1$ e) NOTA

25. $f(x) = x^3 + x$. Find the value of $\frac{d}{dx} f^{-1}(x)$ at $x = 30$.

- a) $\frac{1}{28}$ b) $\frac{1}{2701}$
c) $\frac{1}{61}$ d) $\frac{1}{3301}$ e) NOTA

26. f has a maximum value of 2 at $x = 1$.

$f(x) = axe^{bx^2}$. Find ab .

- a) $\frac{-\sqrt{e}}{2}$ b) $-\sqrt{e}$ c) $\frac{1}{e}$ d) $2e$ e) NOTA

27. $f'(x) = \ln(x - 2)$. Where is f concave down?

- a) $(-\infty, 2)$ b) $(-\infty, 2) \cup (2, \infty)$
c) $(2, \infty)$ d) $(2, 3)$ e) NOTA

28. $\lim_{h \rightarrow 0} \frac{2\text{Arcsin}(\frac{1}{2} + h) - \frac{\pi}{3}}{h} =$

- a) 0 b) $\frac{\sqrt{3}}{2}$ c) $\sqrt{3}$ d) $\frac{4\sqrt{3}}{3}$ e) NOTA

29. The region in the first quadrant bounded by the graph of $y = \text{Arctan}(x)$, $y = \frac{\pi}{4}$, and the y -axis is rotated about the y -axis. The volume of the solid generated is given by which of the following expressions?

a) $\pi \int_0^1 (\text{Arctan}(x))^2 dx$

b) $\pi \int_0^{\frac{\pi}{4}} (\text{Arctan}(x))^2 dx$

c) $\pi \int_0^1 (\tan(y))^2 dy$

d) $\pi \int_0^{\frac{\pi}{4}} (\tan(y))^2 dy$

30. $\int \frac{\sin(x^2) - 2x}{\sin(x^2)} dx =$

a) $x - \ln|\csc(x^2) - \cot(x^2)| + C$

b) $x + \cos(x^2) + C$

c) $x - 2\ln|\sin(x^2)| + C$

d) $x - \cot(x^2) + C$

e) NOTA