

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  $\theta$  between these sides is increased from  $30^\circ$  to  $33^\circ$  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)  $\pi$       b)  $2\pi$       c)  $6\pi$       d)  $8\pi$       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)  $\pi \int_0^{\frac{\pi}{4}} (\tan(y))^2 dy$

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

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