

(N.O.T. stands for None Of These)

1. The value of  $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x^2}$  is
- a)  $\frac{1}{2}$                       b)  $-1$                       c)  $-\frac{1}{2}$                       d)  $0$                       e) N.O.T.
2. If  $f(x) = e^{\sin(2^x - 1)}$  then what is the value of  $f'(0)$ ?
- a)  $e^{\sin(1)} \ln 2$                       b)  $e^{\sin(1)}$                       c)  $e$                       d)  $\ln 2$                       e) N.O.T.
3. If  $\int_4^1 f(x) dx = -3$ ,  $\int_1^{12} f(x) dx = 7$ ,  $\int_4^6 g(x) dx = -1$ ,  $\int_6^{12} g(x) dx = 5$ ,  
then the value of  $\int_4^{12} [2f(x) - g(x)] dx$  is:
- a)  $0$                       b)  $4$                       c)  $16$                       d)  $14$                       e) N.O.T.
4. If  $f(x) = -2|x - 2|$  what is the value of  $\lim_{x \rightarrow 2^-} f'(x)$ ?
- a)  $0$                       b)  $2$                       c)  $1$                       d)  $-2$                       e) N.O.T.
5. The graph of  $f(x) = (x^2 - 16)^{\frac{2}{3}}$  has a cusp at  $x =$
- a)  $0$                       b)  $2$                       c)  $4$                       d)  $-2$                       e) N.O.T.
6. Using the function  $f(x) = \cot(x)$  on the interval  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ , find the value of  $x = c$  that satisfies Rolle's Thm.
- a)  $\frac{\pi}{4}$                       b)  $0$                       c)  $-\frac{\pi}{4}$                       d)  $-\frac{\pi}{6}$                       e) N.O.T.
7. The value of  $\lim_{x \rightarrow -\frac{\pi}{2}} \cot x + \sin x$  is
- a)  $-1$                       b)  $1$                       c)  $0$                       d)  $\frac{-\sqrt{2}}{2}$                       e) N.O.T.
8. The function  $f(x) = \frac{8x-4}{x^2+2x+1}$  is not continuous at  $x =$
- a)  $-\frac{1}{2}$                       b)  $-1$                       c)  $\frac{1}{2}$                       d)  $1$                       e) N.O.T.
9.  $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^2-5}}{x+2} =$
- a)  $4$                       b)  $0$                       c)  $2$                       d)  $-2$                       e) N.O.T.

10. If  $f(x) = \begin{cases} \sin x & \text{if } x < 0 \\ e^x & \text{if } x \geq 0 \end{cases}$  then  $\lim_{x \rightarrow 0^+} f(x)$  is
- a)  $-e$                       b)  $e$                       c)  $0$                       d)  $-1$                       e) N.O.T
11. The sum of the x-values of the inflection points of the function  $f(x) = -\frac{1}{12}x^4 - \frac{1}{2}x^3 + 5x^2 + x + 2$  is:
- a)  $0$                       b)  $-1$                       c)  $3$                       d)  $2$                       e) N.O.T
12. The horizontal asymptote of  $f(x) = \frac{1}{x+2} - 1$  is  $y =$
- a)  $2$                       b)  $-2$                       c)  $-1$                       d)  $0$                       e) N.O.T
13. A lighthouse is located on an island that is 4 km from the nearest point B on a straight shoreline. If the light makes a revolution every 10 seconds, how fast (in km/s) is the light moving along the shore at the moment it is 1 km from point B?
- a)  $\frac{17\pi}{20}$                       b)  $\frac{2\pi}{10}$                       c)  $\frac{2\pi}{5}$                       d)  $\frac{17\pi}{10}$                       e) N.O.T
14.  $\lim_{h \rightarrow 0} \frac{(4+h)^{-2} - (4)^{-2}}{h}$  simplifies into:
- a)  $-\frac{1}{16}$                       b)  $-\frac{1}{32}$                       c)  $-\frac{1}{4}$                       d)  $-\frac{1}{8}$                       e) N.O.T
15.  $\int_{-3}^3 [4 - 2|x + 1|] dx =$
- a)  $12$                       b)  $36$                       c)  $-6$                       d)  $-18$                       e) N.O.T
16. Let  $f(x) = 3x^4 + 4x^3 - 36x^2$   
The sum of the x-value(s) where  $f(x)$  has a local minimum is
- a)  $0$                       b)  $-1$                       c)  $5$                       d)  $-2$                       e) N.O.T
17. Find the slope of the tangent line to the curve  $\sin(x + y) = 3x - 3y$  at the point  $(\pi, \pi)$
- a)  $0$                       b)  $1$                       c)  $\frac{2}{3}$                       d)  $\frac{1}{2}$                       e) N.O.T
18. The function  $g(x) = x^{\frac{2}{3}}(x - 1)$  is concave up on the entirety of which of the following intervals?
- a)  $[-\frac{1}{5}, \infty)$                       b)  $(-\frac{1}{5}, \infty)$                       c)  $(-\infty, 0)$                       d)  $(-\frac{1}{5}, 0)$                       e) N.O.T
19. The acceleration of a particle can be modeled by  $a(t) = 3t - 5$  on  $[0, 10]$ . If the initial velocity of the particle is given by  $v(0) = -4$  find the maximum velocity on the given interval.
- a)  $96$                       b)  $94$                       c)  $3$                       d)  $90$                       e) N.O.T

20.

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \frac{\cos \theta}{\sin^3 \theta} d\theta =$$

- a) 2                      b)  $\frac{\sqrt{2}}{2}$                       c)  $4 - \frac{\sqrt{2}}{2}$                       d)  $\sqrt{4 - \frac{\sqrt{2}}{2}}$                       e) N.O.T

21. The x-value of a point on the ellipse  $4x^2 + y^2 = 4$  that is farthest from the point (1,0) is:

- a) -1                      b)  $-\frac{1}{2}$                       c)  $-\frac{1}{3}$                       d)  $-\frac{1}{4}$                       e) N.O.T

22. A piece of wire 5m long is cut into two pieces. One is bent into a square and the other into a circle. How much wire should be used to form the circle so that the total area in the shapes is a minimum?

- a)  $\frac{10\pi}{8+2\pi}$                       b) 5                      c)  $\frac{2-8\pi}{2+2\pi}$                       d)  $\frac{5}{2\pi}$                       e) N.O.T

23. Find the value of  $c$  that satisfies the conditions of the Mean Value Theorem on the interval [1,5] for the function  $f(x) = \ln(x)$

- a)  $\frac{\ln 5}{4}$                       b)  $\frac{\ln 4}{5}$                       c)  $\frac{4}{\ln 5}$                       d)  $\frac{5}{\ln 4}$                       e) N.O.T

24. Find the slope of the tangent line to  $y = \sin(\ln(x))$  at  $x = e^\pi$

- a)  $e^{-\pi}$                       b)  $-e^{-\pi}$                       c)  $e^\pi$                       d)  $-e^\pi$                       e) N.O.T

25. If  $f(x) = \int_1^{\sin x} e^t dt$  then  $f'(\frac{\pi}{2}) =$

- a)  $e$                       b) 1                      c) 0                      d) -1                      e) N.O.T

26. If  $f(x) = ax^{-b+1}$  where  $a, b$  are both positive constants, what is the value of  $f'(1)$ ?

- a)  $\frac{a}{b}$                       b)  $ab$                       c)  $b$                       d)  $\frac{1}{a}$                       e) N.O.T

27. Given  $x^2 + y^2 = \tan(xy) + 1$ , then  $y' =$

- a)  $\frac{y-2x \cos^2(xy)}{2y \cos^2(xy)-1}$                       b)  $\frac{y \sec^2(xy)-2x}{2y-\sec^2(xy)}$                       c)  $\frac{1-2x \cos^2(xy)}{2y \cos^2(xy)-x}$                       d)  $\frac{\sec^2(xy)-2x}{2y-x \sec^2(xy)}$                       e) N.O.T

28.  $\int \frac{x}{\sqrt{1-x^4}} dx =$

- a)  $\frac{1}{2} \arctan(x^2) + C$                       b)  $\frac{1}{2} \arccos(x^2) + C$                       c)  $\frac{1}{4} \arctan(x^4) + C$                       d)  $\frac{1}{4} \arccos(x^4) + C$                       e) N.O.T

29. The average value of  $f(x) = \sqrt{x+2}$  on  $[-2,3]$  is

- a)  $\frac{2\sqrt{5}}{3}$                       b)  $\frac{10\sqrt{5}}{3}$                       c) No solution                      d)  $\sqrt{5}$                       e) N.O.T

30. If  $\int_1^3 f(x) dx = 7$  and  $\int_{10}^3 f(x) dx = 2$  then  $\int_1^{10} f(x) dx =$

- a) -9                      b) -5                      c) 9                      d) 5                      e) N.O.T

31. Find the area of the region bounded by the three curves below for  $x > 0$ :

$$y = \frac{1}{x} \quad y = x \quad y = \frac{1}{4}x$$

- a)  $\ln 2$                       b)  $\ln 2 - \frac{1}{4}$                       c)  $\ln 2 - \frac{1}{8}$                       d) 2                      e) N.O.T

32. Let  $f(x) = 7 + \sqrt{x}$ . Then  $\frac{f(x+h)-f(x)}{h}$  is equal to

- a)  $\frac{h}{\sqrt{x+h}+\sqrt{x}}$                       b)  $\frac{-1}{\sqrt{x+h}+\sqrt{x}}$                       c)  $\frac{h}{\sqrt{x+h}-\sqrt{x}}$                       d)  $\frac{-1}{\sqrt{x+h}-\sqrt{x}}$                       e) N.O.T

33. A particle is oscillating about the origin with its position given by the equation  $y = 5 \sin(2\pi t) + 1$  cm at  $t$  seconds. What is the velocity of the particle at  $t = 7$  seconds in cm/s?

- a) 0                      b)  $-10\pi$                       c)  $10\pi$                       d) -10                      e) N.O.T

34. If  $f'(x) = e^{-3x} + 1$  and  $f(0) = \frac{5}{4}$  then  $f(x) =$

- a)  $-3e^{-3x} + x + \frac{17}{4}$                       b)  $-\frac{1}{3}e^{-3x} + x + \frac{5}{4}$                       c)  $-\frac{1}{3}e^{-3x} + x + \frac{19}{12}$                       d)  $\frac{1}{3}e^{-3x} + x + \frac{11}{12}$                       e) N.O.T

35. Let  $f(x) = x^5 - x$ . Find the difference between the slope of the secant line joining  $(1, f(1))$  to  $(2, f(2))$  and the slope of the tangent line at  $(2, f(2))$ .

- a) 25                      b) -64                      c) 49                      d) -16                      e) N.O.T

36. Using the table below, find the difference between approximating  $\int_0^{20} f(x) dx$  using the rectangular method with right endpoints and the rectangular method with left endpoints.

$x$	0	5	10	15	20
$f(x)$	7	4	2	-3	-4

- a) -55                      b) 11                      c) 55                      d) -11                      e) N.O.T

37. The derivative of  $\tan^{-1}\left(\frac{x}{2}\right)$  is

- a)  $\frac{8}{4+x^2}$                       b)  $\frac{2}{4+x^2}$                       c)  $\frac{1}{4+x^2}$                       d)  $\frac{8}{2+x^2}$                       e) N.O.T

38. What is  $\lim_{x \rightarrow 0^+} x^x$ ?

a)  $-\infty$

b)  $\infty$

c) Does not exist

d) 0

e) N.O.T

39. Find the area of the region bounded by the curves  $x = y^4$ ,  $y = \sqrt{2-x}$ , and  $y = 0$

a)  $\frac{7}{15}$

b)  $\frac{22}{15}$

c) 6

d)  $\frac{1}{6}$

e) N.O.T

40. If  $y = \frac{(x+1)^2}{(3x-2)^4}$  then  $y' =$

a)  $\frac{-2(x+1)}{(3x-2)^4}$

b)  $\frac{2x+2}{324x^3-648x^2+432x-96}$

c)  $\frac{(x+1)}{2(3x-2)^3}$

d)  $\frac{-2(x+1)(3x+8)}{(3x-2)^5}$

e) N.O.T