

For all questions, "E. NOTA" means none of the answers is correct. Unless otherwise stated, assume all numbers are real.

1. Identify the points of inflection for the function $g(x) = x - 9\sqrt{x}$.

- a) $x = 0$ b) $x = \frac{81}{4}$ c) $x = 0$ and $x = \frac{81}{4}$ d) No inflection points e) NOTA

2. What is the trapezoidal approximation of $\int_{-4}^0 x^2 + 2x - 3 \, dx$ if 2 equal subdivisions are used?

- a) $-\frac{20}{3}$ b) -4 c) 14 d) DNE e) NOTA

3. Let $f(x) = 2 + e^{2x}$. Find $f'(0)$.

- a) 32 b) 64 c) 108 d) 216 e) NOTA

4. Evaluate $\lim_{x \rightarrow 5^+} \frac{|x-5|}{5-x}$.

- a) -1 b) 0 c) 1 d) DNE e) NOTA

5. When the value of $\cos 2$ is approximated by using the 4th degree Maclaurin polynomial for $\cos x$, the value of $\cos 2$ is

- a) $2 - \frac{8}{3!} + \frac{32}{5!}$ b) $2 - \frac{4}{2!} + \frac{16}{4!}$ c) $1 - \frac{4}{2!} + \frac{16}{4!}$ d) $1 - \frac{8}{3!} - \frac{32}{5!}$ e) NOTA

6. The base of a solid is the region in the 1st quadrant bounded by the line $y = -2x + 6$ and the coordinate axes. What is the volume of the solid if every cross-section perpendicular to the x-axis is a rectangle with a height of 4?

- a) 36 b) 24 c) 16 d) 12 e) NOTA

7. If $f(x) = x - 2^x$, for $-1 \leq x \leq 5$, then a value for c as prescribed by Rolle's Theorem is

- a) 0 b) 2 c) 5 d) $\frac{7\pi}{2}$ e) NOTA

8. Let $y = \sec 2x$. Find $y''(0)$.

- a) 8 b) 4 c) 2 d) 0 e) NOTA

9. The solution of a differential equation is roughly approximated using Euler's Method and a step of $h = 0.2$. If $y' = y - x$ and $y(3) = 4$, then $y(3.4) \approx ?$

- a) 4.4 b) 4.56 c) 5.19 d) 3.68 e) NOTA

10. For $9x^2 + y^2 = 9$, find y'' .

- a) $\frac{9y^2 + 81x^2}{y^3}$ b) $\frac{-9x}{y}$ c) $\frac{-81}{y^3}$ d) $\frac{81x^2 - 9y^2}{y^3}$ e) NOTA

11. Let $f(x)$ be a differentiable function of x and let $\frac{d(f(x))}{dx} = g(x)$. If $y = \sqrt{f(x) - 7}$, then $\frac{dy}{dx} =$

- a) $\frac{1}{2\sqrt{f(x) - 7}}$ b) $\frac{1}{2\sqrt{g(x) - 7}}$ c) $\sqrt{f(x) - 7} g(x)$ d) $\frac{g(x)}{2\sqrt{f(x) - 7}}$ e) NOTA

12. Let $y = x^{\sin x}$. Find $y'\left(\frac{\pi}{2}\right)$.

- a) $\frac{\pi}{2}$ b) $\frac{\pi}{2} \left(\frac{2}{\pi} + \ln\left(\frac{\pi}{2}\right) \right)$ c) 1 d) 0 e) NOTA

13. Find $\lim_{n \rightarrow \infty} \left(1 + \frac{2c}{n}\right)^n$.

- a) 0 b) 1 c) e^{2c} d) e^n e) NOTA

14. Find $\frac{d}{dx} \int_{-4}^{x^2} \frac{x^3 - 7x^5}{x} dx$.

- a) $\frac{x^6 - 7x^2}{x^2}$ b) $\frac{x^3 - 7x^5}{x^2}$ c) $\frac{2x^6 - 14x^2}{x}$ d) $\frac{2x^6 - 7x^2}{x}$ e) NOTA

15. Find the slope of the line tangent to the graph of $3x^4 - xy^2 + 3y = -1$ at the point $(1, 4)$.

- a) $-\frac{4}{5}$ b) $-\frac{3}{5}$ c) $\frac{28}{5}$ d) $\frac{29}{5}$ e) NOTA

16. The slope of the line normal to the curve $f(x) = \cos^2 3x$ at $x = \frac{\pi}{6}$ is

- a) 3 b) $-\frac{1}{3}$ c) 0 d) ∞ e) NOTA

17. Let $f(x)$ be a continuous and differentiable function on $[0, 1]$, and let $g(x) = f(3x)$. Using the table below, what is the value of $g'(0.2)$?

x	0.1	0.2	0.3	0.4	0.5	0.6
$f'(x)$	2.03	2.045	2.089	2.163	2.302	2.473

- a) 2.045 b) 2.473 c) 6.135 d) 7.419 e) NOTA

18. Find $\int_6^{10} g(x)dx$ if $g'(x) = \frac{-1}{x-5}^2$ and $g(6) = 4$, then

- a) $-\frac{4}{5}$ b) $\frac{16}{5}$ c) $12 + \ln 5$ d) $\ln 5$ e) NOTA

19. Find the critical numbers of the function $g(x) = \frac{x-5}{x}$.

- a) 0 b) 5 c) 0 and 5 d) No critical numbers e) NOTA

20. Evaluate $\lim_{x \rightarrow 0} \frac{e^x - 1}{\sin x}$.

- a) 0 b) 1 c) e d) DNE e) NOTA

21. Given $f(x) = \cos 3x + x$ and let A = the slope of the tangent to f at $\left(\frac{\pi}{3}, \frac{\pi-3}{3}\right)$; B = the slope of the tangent to f at $\left(\frac{\pi}{6}, \frac{\pi}{6}\right)$; and C = the slope of the tangent to f at $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$. Arrange A, B, and C in order of greatest slope to least slope.

- a) A, B, C b) B, C, A c) C, A, B d) C, B, A e) NOTA

22. The linear approximation of $f(x) = \frac{e^x}{x^2 - 2}$ at $x = 1$ for $f(1.2)$ is:

- a) $-3e$ b) $-1.6e$ c) $0.4e$ d) $2.6e$ e) NOTA

23. Identify the interval(s) below where the function $f(x) = x^2 \sqrt{x^2 - 24}$ is increasing.

- a) $-\infty, 0$ b) $-\infty, -2\sqrt{6}$ c) $0, \infty$ d) $2\sqrt{6}, \infty$ e) NOTA

24. Evaluate $\lim_{x \rightarrow \infty} \frac{\sqrt[3]{5 + 3x^2 - 27x^3}}{\sqrt[4]{16x^4 - 9x^2 + 21}}$.

- a) $\frac{\sqrt[3]{5}}{\sqrt[4]{16}}$ b) $\frac{5}{16}$ c) $-\frac{3}{2}$ d) $-\frac{27}{16}$ e) NOTA

25. Find the interval of convergence of the Maclaurin series for $f(x) = \frac{x}{1-9x^2}$

- a) $\left(-\frac{1}{3}, \frac{1}{3}\right)$ b) $\left(-\frac{1}{9}, \frac{1}{9}\right)$ c) $\left[-\frac{1}{3}, \frac{1}{3}\right]$ d) $\left[-\frac{1}{9}, \frac{1}{9}\right]$ e) NOTA

Answers

1. d
2. b
3. d
4. c
5. c
6. a
7. b
8. b
9. a
10. c
11. d
12. c
13. c
14. d
15. a
16. d
17. d
18. c
19. d
20. b
21. c
22. b
23. d
24. c
25. a