

Question 5

Not yet answered

Marked out of 1

$$\int \frac{x}{x-1} dx$$

Select one:

- ☐ a. $\ln(x+1)$
- ☐ b. $x + \ln(x-1)$
- ☐ c. $e^{\frac{x+1}{x}}$
- ☐ d. $\ln\left(\frac{x-1}{x}\right)$

Question 6

Not yet answered

Marked out of 1

Given that a is a positive constant, evaluate $\int_a^{3a} \left(\frac{2x+1}{x} \right) dx$

Select one:

- ☐ a. $3a + \ln 4$
- ☐ b. $4a + \ln 3$
- ☐ c. $-3a + \ln 3$
- ☐ d. $5a + \ln 3$

Question 7

Not yet answered

Marked out of 1

Find $\int \left(\frac{\cos x}{\sin^2 x} - 2e^{2x} \right) dx$

Select one:

- ☐ a. $\operatorname{cosec} x - e^{2x} + c$
- ☐ b. $-\operatorname{cosec} x - 3e^{2x} + c$
- ☐ c. $-\operatorname{cosec} x - e^{2x} + c$
- ☐ d. $\operatorname{cosec} x - 2e^{2x} + c$

C





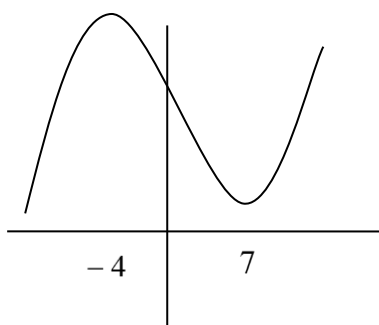
University of Lagos, Akoka
Department of Mathematics
MTH 102: Calculus, ASSIGNMENT
SUBMISSION DATE: 12TH JULY, 2025

1. Given that $f(x) = \frac{x-2}{1-3x}$ What is $f(0)$? A. **-2** B. 2 C. -1.0 D. 1.00
2. Given that $f(x+1) = \frac{x-2}{1-3x}$ What is $f^{-1}(x)$? A. $\frac{1+3x}{x-2}$ B. $\frac{1-3x}{3x-1}$ C. **$\frac{4x+3}{1+3x}$** D. $\frac{x+2}{1+3x}$
3. Find the derivative of $y = \ln ax$? A. **$\frac{a}{x}$** B. $\frac{x}{\ln ax}$ C. $\frac{1}{ax}$ D. e^{ax} **1/x**
4. Given that $Z(x, y) = e^{x\sqrt{y}}$, obtain Z_{xx} A. $\sqrt{y}e^{xy}$ B. $\sqrt{y}e^{\sqrt{xy}}$ C. $x^2e^{x\sqrt{y}}$ D. **$ye^{x\sqrt{y}}$**
5. The curve $y = 11 - 12x + 6x^2 - x^3$ has one of the following,
 - A. All of the above
 - B. Minimum point
 - C. **Point of inflexion**
 - D. maximum point
6. If the average cost per unit atom is given by the function $C(q) = 1000 - 24q + q^2$, where q is the mass produced. What unit of mass will minimize the average cost per unit?
 - A. 10
 - B. **12**
 - C. 14
 - D. 16
7. The normal at the point $t = \frac{\pi}{4}$ to the curve $x = 3\cos t - \cos^3 t$, $y = 3\sin t - \sin^3 t$ passes the point?
 - A. (1, 2)
 - B. (-1, 2)
 - C. $(-\pi, 0)$
 - D. **(0, 0)**
8. The equation of the tangent of the curve $y^2 = 3x^2 + 1$ is?
 - A. $x + 2y = 1$
 - B. $x - 3y + 1 = 0$
 - C. $2x + 3y = 8$
 - D. **$3x - 2y + 1 = 0$**
9. The equation of the normal of the curve $y^2 = 3x^2 + 1$ is?
 - A. $x + 2y = 1$
 - B. $x - 3y + 1 = 0$
 - C. **$2x + 3y = 8$**
 - D. $3x - 2y + 1 = 0$
10. What is $\lim_{x \rightarrow 0} \frac{x}{\sqrt{1 - \cos x}}$, A. **$\sqrt{2}$** B. ∞ C. $2\sqrt{2}$ D. 1
11. Evaluate $\lim_{x \rightarrow 2} \frac{x^2 - 3x + 2}{x^2 - 6x + 8}$, A. **$\frac{1}{2}$** B. $\frac{1}{4}$ C. 1 D. ∞
12. Evaluate $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$, A. $\log_e x$ B. **$\log_e a$** C. 1 D. ∞
13. The function $f(x) = \frac{1}{x}$ is discontinuous at the point?
 - A. **0**
 - B. 1
 - C. 2
 - D. 3
14. Find $\frac{d}{dx} \left(\ln \left(\frac{x^2}{x+1} \right) \right)$, A. $\frac{1-x^2}{x(x^2+1)}$ B. $\frac{1-x}{x(1+x)}$ C. $\ln \left(\frac{2}{x(x^2+1)} \right)$ D. **$\frac{x+2}{x(x+1)}$**
15. What is $\frac{d}{dx} (-\ln(\cos x))$, A. $\sec x$ B. $-\tan x$ C. **$\tan x$** D. $\cot x$
16. Obtain $\frac{dy}{dx}$, if $y = e^{1-2x}$, what is y' at $x = \frac{1}{2}$. A. 1 B. **-2** C. e^2 D. 2
17. Find the derivative of $y = e^{2x} \ln(x+6)$ A. $\frac{e^{2x}}{x+6} + 2\ln(x+6)$ B. $\frac{e^{2x}}{x+6} + \ln(x+6)$ C. $e^{2x} + \frac{2\ln(x+6)}{x+6}$ D. **$\frac{e^{2x}}{x+6} + 2e^{2x} \ln(x+6)$**

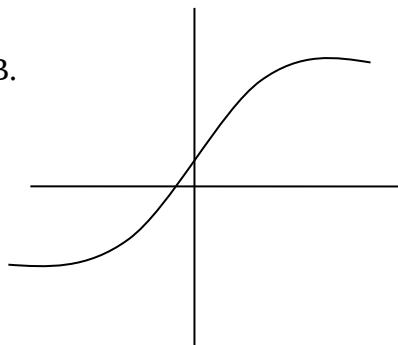
18. Find the derivative of $y = 3\log(x-1)$ A. $\frac{x-1}{3}$ B. $\frac{1}{3(x-1)}$ C. $\frac{3}{x-1}$ D. $3e^{x-1}$
19. Find the derivative of $y = \sin^2 x$, A. $\sin 2x$ B. $-2\sin x \cos x$ C. $2\sin x$ D. $2\cos x$
20. Find the derivative of $y(x) = \log_2 x$, A. $e^{a \ln x}$ B. $\frac{x^{-a}}{\log 2}$ C. $\frac{x}{\log a}$ D. $\sqrt{a} \ln x$
21. Find the gradient of $y = \frac{1 - \cos x}{1 + \cos x}$ at $x = \frac{\pi}{2}$, A. π B. -2 C. ∞ D. 2
22. What is $\lim_{x \rightarrow 0} \frac{1 - \cos x}{\sin^2 x}$, A. 0 B. 1 C. 2 D. 0.5
23. If $\frac{1}{a} \int \sec ax \tan ax dx$, find $\frac{dy}{dx}$, A. $\frac{\tan^2 ax}{2}$ B. $\frac{\sec^2 ax}{a^2}$ C. $\frac{\sec^2 ax}{2}$ D. $\sec ax$
24. If $y = \sqrt{\sin x}$, $\frac{dy}{dx}$ is A. $\frac{\cos x}{\sqrt{\sin x}}$ B. $\frac{\cos x}{2\sqrt{\sin x}}$ C. $\frac{\sin x}{\sqrt{\cos x}}$ D. $\sqrt{\cos x}$
25. If $y = e^{ax^2+b}$, $\frac{dy}{dx}$ is A. e^{ax^2+b} B. be^{ax^2+b} C. $(a^2+b)e^{ax^2+b}$ D. $2axe^{ax^2+b}$
26. Given $y = \frac{1+x^2}{1-x^2}$, find $\frac{dy}{dx}$ A. $\frac{x}{(1-x^2)}$ B. $\frac{4x}{(1-x^2)}$ C. $\frac{4x}{(1-x^2)^2}$ D. $\frac{2x}{(1-x^2)}$
27. Using the substitution $t = \tan \frac{1}{2}x$ solve $\int \frac{dx}{1 - \cos x}$
A. $\tan \frac{1}{2}x$ B. $\tan^{-1}\left(\frac{1}{2}x\right)$ C. $-\frac{1}{\tan\left(\frac{1}{2}x\right)}$ D. $\frac{1}{1 - \sin x}$
28. Integrate $\int e^{\cos x} \sin x dx$ A. $-e^{\sin x}$ B. $-e^{\cos x}$ C. $e^{\cos x}$ D. $\sin x$
29. The function $y = x^3 + 6x^2 - 15x + 5$ has a minimum point at $x = ?$
A. 1 B. 2 C. 3 D. 4
30. The function $y = x^3 + 6x^2 - 15x + 5$ has a maximum point at $x = ?$
A. 0 B. -5 C. 5 D. 2
31. The function $y = x^3 + 6x^2 - 15x + 5$ has a maximum value of $y = ?$
A. 15 B. 105 C. 1005 D. 5
32. The function $y = x^3 + 6x^2 - 15x + 5$ has a minimum value of $y = ?$
A. -7 B. -3 C. 3 D. -9
33. The function $y = \frac{\log x}{x}$ has the maximum value at point $x = ?$ A. 1 B. 0 C. e D. ∞
34. The function $y = x^3 - 6x^2 + 11x - 6$ has a minimum value at point $x = ?$.
A. $2 + \frac{1}{\sqrt{3}}$ B. $\frac{2}{\sqrt{3}}$ C. $-2 + \frac{1}{\sqrt{3}}$ D. $2 - \frac{1}{\sqrt{3}}$
35. The function $y = x^3 - 6x^2 + 11x - 6$ has a maximum value at point $x = ?$.
A. $2 + \frac{1}{\sqrt{3}}$ B. $\frac{2}{\sqrt{3}}$ C. $-2 + \frac{1}{\sqrt{3}}$ D. $2 - \frac{1}{\sqrt{3}}$
36. If $y = (3x-2)(3-x)$ $\frac{dy}{dx}$ is, A. $2x(3x-2)$ B. $-3x^2 - 11x - 6$ C. $6 - 11x$ D. $11 - 6x$
37. Find the derivative of $y = \sec ax$ A. $\cos x$ B. $\tan^2 x$ C. $a \sec ax \tan ax$ D. $\sin x$

38. The motion of a particle from O, is described by the equations $S = \frac{2}{3}t^3 - \frac{17}{2}t^2 + 21t$ where S is the distance in metres, and t the time in seconds. Find the acceleration of the particles when it is momentarily at rest. A. $45ms^{-2}$ B. $11ms^{-2}$ C. $-9ms^{-2}$ D. $4ms^{-2}$
39. The motion of a particle along a straight line is specified by the equation $x = 4t^4 - 3t^3$, find the velocity after 3 seconds. A. $513ms^{-1}$ B. $378ms^{-2}$ C. $351ms^{-1}$ D. $486ms^{-2}$
40. The motion of a particle along a straight line is specified by the equation $x = 4t^4 - 3t^3$, find the acceleration after 3 seconds. A. $513ms^{-1}$ B. $378ms^{-2}$ C. $351ms^{-1}$ D. $486ms^{-2}$
41. The second derivative of $3\sin 2x$ is A. $-12\sin 2x$ B. $6\sin 2x$ C. $6\cos 2x$ D. $12\cos 2x$
42. Find the area between the curve $y = x^2$ and the x -axis between $x_1 = 0$ and $x_2 = 2$.
A. 16sq. units B. $\frac{10}{3}$ sq. units C. $\frac{8}{3}$ sq. units D. 11sq. units
43. For an approximate integration of a function $y(x)$ on the interval $[1,5]$, what is the number of ordinates if the interval has an equal spacing of $h = 0.25$? A. 16 B. 17 C. 18 D. 19
44. Which of the following is true about the function $y = e^{3x+1}$,
A. $y'' + y' = 6$
B. $y'' + y' = 6y$ C. $y'' + y' - 6y^2 = 0$ D. $y'' - y' = 6y$
45. Which of the following is true about the function $y = \sin 2x$,
A. $y'' + 4y = 0$
B. $y'' + 4y' = 0$ C. $y'' + 4y^2 = 0$ D. $y'' = y' + 4$
46. Given the function $y = \sin^2 x$, what is y' ? A. $\sin 2x$ B. $2\sin x$ C. $\cos 2x$ D. $\cos^2 x$
47. Integrate $\int (x+7)^4 dx$ A. $\frac{1}{5}(x+7)^5$ B. $\frac{1}{4}(x+7)^4$ C. $(x+7)^5$ D. $\frac{(x+7)^6}{5}$
48. Find $\int (x^3 - 2x - 1)dx$ A. $12x^2 + 3$ B. $\frac{x^4}{4} - x^2 - x$ C. $3x^2 - 2$ D. $\frac{1}{4}(12x^2 + 3)$
49. The differential equation $(y'')^2 + (y')^3 - 3xy' = 2y$ is of order A. 1 B. 2 C. 3 D. 4
50. The differential equation $(y'')^2 + (y')^3 - 3xy' = 2y$ is of degree A. 4 B. 3 C. 2 D. 1
51. What is $\frac{d}{dx}(\tan^{-1} ax)$, A. $\frac{-1}{\sqrt{x^2 - 1}}$ B. $\frac{-1}{\sqrt{1 - x^2}}$ C. $\frac{-1}{2\sqrt{x(1-x)}}$ D. $\frac{1}{1+x^2}$
52. Find the derivatives of $y = \ln(3x^2 + 2) - e^{3\sin x}$ at $x = 0$. A. -6 B. -3 C. -1 D. 0
53. If $U(r, s) = 3s^2r - 2r \log s$, what is $\frac{\partial^2 U}{\partial r^2}$, A. $6sr$ B. 0 C. $6s + r^2$ D. s^2
54. Find the derivative of $y = \sin 2x$ at $x = \frac{\pi}{2}$ A. $-\frac{\sqrt{2}}{2}$ B. $\sqrt{2}$ C. $2\sqrt{2}$ D. -2
55. Differentiate the implicit function $3(x+y) + 2xy = \cos x$ A. $\frac{2y+3}{\sin x - (x^2+1)}$
B. $-\frac{(\sin x + 2y + 3)}{2x + 3}$ C. $-\frac{(\sin x + 2y + 3)}{2x - 3}$ D. $-\frac{(\cos x + 2y + 3)}{2x + 3}$
56. The curve given by $4x^3 + 15x^2 - 18x + 7$ will look like one of the following

A



B.



C.

