Lagos State University, Ojo
Department of Mathematics
Rain Semester Examination :: 2015/2016 Session
MAT 112 - Calculus

Time Allowed: *1$\frac{1}{2}$ Hours*
Instruction: Answer All Questions.

1. if $x - 2016 = 0$, then $\frac{dx}{dy}$ is (A) 2016 (B) $\frac{1}{2016}$ (C) ∞ (D) 0

2. Integrate $x\exp(3x)$ *w.r.t* x (A) $\frac{1}{3}\exp(3x) + \frac{1}{9}x\exp(3x) + c$ (B) $3x\exp(3x) + \exp(3x) + c$ (C) $\frac{1}{3}x\exp(3x) - \frac{1}{9}\exp(3x) + c$ (D) $3x\exp(3x) - x^2 + c$

3. If $y = \exp(\cos x)$, then y' is (A) $\exp(\sin x)\cos x$ (B) $-\exp(\cos x)\sin x$ (C) $\exp(\cos x)\cos x$ (D) $-\exp(\sin x)\cos x$

4. A rule which assigns to each element of a set X a unique element of another set Y is known as (A) *Limit* (B) *Integration* (C) *Differentiation* (D) *Function*

5. Evaluate $\int \exp(x)\sin x dx$ (A) $\exp(x)\cos x + c$ (B) $\exp(x)(\cos x - \sin x) + c$ (C) $\frac{1}{2}\exp(x)(\cos x + \sin x) + c$ (D) $\frac{1}{2}\exp(x)(-\cos x + \sin x) + c$

6. Integrate $\sin^2 x$ *w.r.t* x (A) $\frac{1}{2}(x - \frac{1}{2}\sin 2x) + c$ (B) $\frac{1}{2}(x + \frac{1}{2}\sin 2x) + c$ (C) $\frac{1}{2}(x - \frac{1}{2}\cos 2x) + c$ (D) $\frac{1}{2}(x + \frac{1}{2}\cos 2x) + c$

7. Evaluate $\lim_{x\to 1} \frac{x^2+2}{3x^2-1}$ (A) $\frac{3}{2}$ (B) $-\frac{2}{3}$ (C) 1 (D) $\frac{1}{3}$

8. Find the equation of the normal to the curve $y = 3x^2 - 5x$ at the point $(1, -2)$. (A) $y = x - 3$ (B) $y = -(x + 1)$ (C) $y = -(x + 3)$ (D) $y = -x + 1$

9. Differentiate $x - y + 1 = 0$ *w.r.t* x (A) 1 (B) 0 (C) $x + \frac{x^2}{2}$ (D) $1 + x^2$

10. If $y = \sin xy - 2$, then $\frac{dy}{dx}$ is (A) $\frac{\cos xy}{1+\cos xy}$ (B) $\frac{y\cos xy}{1-x\cos xy}$ (C) $\frac{1-x\cos xy}{y\cos xy}$ (D) $\frac{1+\cos xy}{y\cos xy}$

11. Evaluate $\lim_{x\to 0} 3x^2 + 2x - 1$ (A) 3 (B) 2 (C) -1 (D) 0

12. Integrate $x + \exp(x)$ *w.r.t* x (A) $\frac{1}{2}x^2 + \exp(x) + c$ (B) $1 + \exp(x)$ (C) $x\exp(x)$ (D) $2x$

13. Which of these is correct? (A) $\frac{d}{dx}(\cot^{-1}) = \frac{-1}{1+x^2}$ (B) $\frac{d}{dx}(\cot^{-1}) = \frac{1}{1+x^2}$ (C) $\frac{d}{dx}(\cot^{-1}) = \frac{1}{1-x^2}$ (D) $\frac{d}{dx}(\cot^{-1}) = \frac{-1}{x^2+1}$

14. The differential coefficient of $(x^2 - 1)^3$ is (A) $6x(x^2 - 1)$ (B) $6x(x^2 - 1)^2$ (C) $3(x^2 - 1)^2$ (D) $12x^2$

15. Evaluate the integral $\int (6\cos x - 4x^2)dx$ (A) $6\sin x - \frac{4}{3}x^3 + c$ (B) $6\cos x - \frac{4}{3}x^2$ (C) $-6\sin x - 8x + c$ (D) $6\cos x - \frac{4}{3}x^2 + c$

16. Find $\frac{dy}{dx}$ if $y = \exp(x^3)$ (A) $3x^2$ (B) $\exp(x^3)$ (C) $3\exp(x^2)$ (D) $3x^2\exp(x^3)$

17. Find the derivative of $\frac{1}{x^2+4}$ *w.r.t* x (A) $\frac{1}{2}\arctan\left(\frac{x}{2}\right)$ (B) $2x\ln(x^2 + 4)$ (C) $\frac{-2x}{(x^2+4)^2}$ (D) $-2x$

18. Find the equation of the tangent to the curve $27y^2 = 4x^3$ at the point $(3p^2, 2p^3)$ (A) $y = 27px - 4p^2x^2$ (B) $y = p^3 - px$ (C) $y = \frac{1}{p} + px + p^2$ (D) $y = px - p^3$

19. The limit of the function $y = \tan x$ as x tends to infinity is (A) 0 (B) $\sec^2 x$ (C) ∞ (D) $\sec x \tan x$

20. Find $\frac{dy}{dx}$ if $x^2y^2 - x - y = 0$ (A) $2x^2 - 1$ (B) $\frac{1-2xy^2}{2x^2y+1}$ (C) $\frac{1-2xy^2}{2x^2y-1}$ (D) $\frac{2x^2y-1}{2xy^2-1}$

21. The integral $\int \frac{x^3}{(3x^4-5)^6}dx$ (A) $\frac{1}{12}\ln(3x^4 - 5)^6 + c$ (B) $\frac{1}{12}\ln(3x^4 - 5)^5 + c$ (C) $\frac{-1}{60(3x^4-5)^5} + c$ (D) $\frac{-1}{(3x^4-5)^6} + c$

22. Evaluate the integral $\int_{-\frac{\pi}{6}}^{\frac{\pi}{6}} \cot x dx$ (A) $\ln\frac{1}{2}$ (B) $\ln\sqrt{2}$ (C) $\ln 2\sqrt{2}$ (D) $2\sqrt{2}$

23. Evaluate $\lim_{x\to\frac{\pi}{4}} 8\cos x + 3\sin x$ (A) 11 (B) $\frac{11\sqrt{2}}{2}$ (C) $2\pi + \frac{3\pi}{4}$ (D) $\frac{3\pi}{4}$

24. Find $\frac{dy}{dx}$ when $y = \left(\frac{x-1}{x+1}\right)^2$ (A) $\frac{2}{(x+1)^2}$ (B) $2\left(\frac{x-1}{x+1}\right)$ (C) 1 (D) 2

25. Find $\frac{d^2y}{dx^2}$ if $x + y + \sin y = 112$ (A) $\frac{\cos y}{\sin y+1}$ (B) 0 (C) $\frac{\sin y}{(1+\cos y)^3}$ (D) $\frac{\cos y}{(1-\sin y)^2}$

26. Find $\frac{dy}{dx}$ in terms of t when $y = t$ and $x = \frac{1}{t^2}$ (A) $-\frac{t^3}{2}$ (B) $-\frac{1}{2t^3}$ (C) $-\frac{1}{t^2}$ (D) $1 + \frac{1}{t}$

27. Find $\frac{d^2y}{dx^2}$ at the point with abscissa *1* on the curve $y = \frac{1}{t}$, $x = 2t$. (A) -2 (B) 0 (C) 2 (D) 4

28. Evaluate $\frac{d}{dx}\left(\frac{3}{4}x^4 - \frac{1}{2}x^2 + 4\right)$ (A) $3x^3 + x$ (B) $\frac{1}{4}x^5 - \frac{1}{2}x^3$ (C) $3x^3 - x$ (D) $x^3 - x + 4$

29. If $u = \arcsin 3\theta$, then $\frac{du}{d\theta}$ is (A) $\frac{3}{\sqrt{9\theta^2-1}}$ (B) $\frac{9}{3\theta^2+1}$ (C) $\frac{3}{\sqrt{1-9\theta^2}}$ (D) $\frac{9}{\sqrt{3\theta^2+1}}$

30. The gradient of the tangent to the curve $y = \frac{x^2}{x^2+1}$ at the point with abscissa *1* is (A) 1 (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{1}{4}$

31. The rate of change of the area of a circle *w.r.t* its radius is the (A) *Circumference* (B) *Radius* (C) *Chord* (D) *Sector*

32. Find the equation of the tangent to the curve $y = 2x^2 - x + 3$ which is parallel to the line $y = 3x - 2$ (A) $y = x + 1$ (B) $y = x - 1$ (C) $y = 3x + 1$ (D) $y = 3x - 1$

33. At turning point of *f(x) = 0*, which of these is not true? (A) $f'(x) = 0$ (B) $f''(x) = 1$ (C) $f''(x) < 0$ (D) $f''(x) > 0$

34. Which of these is correct at the local maximum of $f(x) = 0$? (A) $f''(x) < 1$ (B) $f''(x) < 0$ (C) $f''(x) < -1$ (D) $f''(x) < \infty$

35. The maximum value of $y = x^3 - 6x^2 + 9x$ is (A) 1 (B) 2 (C) 3 (D) 4

36. The minimum value of $y = x^3 - 6x^2 + 9x$ is (A) 0 (B) 1 (C) 2 (D) 3

37. The point of inflexion of $y = x^4 - 4x^3$ is (A) $(1, 5)$ (B) $(1, 3)$ (C) $(2, 3)$ (D) $(3, 5)$

38. Integrate $\int \sin 3x \cos x dx$ (A) $\frac{1}{3}\cos 8x - \frac{1}{14}\sin 7x + c$ (B) $\frac{1}{6}\sin 3x - \frac{1}{14}\sin 7x + c$ (C) $\frac{1}{8}\cos 2x - \frac{1}{4}\cos 4x + c$ (D) $-\frac{1}{8}\cos 4x - \frac{1}{4}\cos 2x + c$

39. Evaluate $\int_0^a \sqrt{a^2 - x^2} dx$ (A) $\frac{\pi a^2}{2}$ (B) $\frac{\pi a}{4}$ (C) $\frac{\pi^2 a^2}{4}$ (D) $\frac{\pi a^2}{4}$

40. Find the antiderivative of $\cos^2 x$ *w.r.t* x (A) $\frac{1}{2}(x - \frac{1}{2}\sin 2x) + c$ (B) $\frac{1}{2}(x + \frac{1}{2}\sin 2x) + c$ (C) $\frac{1}{2}(x - \frac{1}{2}\cos 2x) + c$ (D) $\frac{1}{2}(x + \frac{1}{2}\cos 2x) + c$

41. Evaluate $\lim_{x\to 1} \frac{x^2+1}{x^2-1}$ (A) 1 (B) -1 (C) 0 (D) ∞

42. Which of these is the first derivative of *f(x)* with respect to x (A) $\lim_{x\to h} \frac{f(x+h)-f(x)}{x}$ (B) $\lim_{h\to x} \frac{f(x+h)+f(x)}{h}$ (C) $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ (D) $\lim_{x\to 0} \frac{f(x+h)-f(x)}{x}$

43. The expression for $\frac{dy}{dx}$ when $y = 6x^2 \sin x \cos x$ is (A) $6x(\sin 2x + x\cos 2x)$ (B) $\sin x + 6x\cos 2x$ (C) $2\cos x + 6x$ (D) $\sin x - \cos x$

44. The slope of $8x^3 - \sin x + 2$ *w.r.t* x is (A) $24x^2 + \cos x$ (B) $x^2 - \sin x$ (C) $x^2 + \sin x$ (D) $24x^2 - \cos x$

45. Find $\frac{du}{d\theta}$ if $u = \frac{\theta \sin\theta}{\theta+3}$ (A) $\frac{\cos\theta - \theta\sin\theta}{(\theta+3)^2}$ (B) $\frac{3\cos\theta - (3+\theta)\theta\sin\theta}{(\theta+3)^2}$ (C) $\frac{\theta\cos\theta+1}{\theta^2(\theta+3)^2}$ (D) $\theta\sin\theta$

46. The gradient at any point t on the curve $\frac{x^2}{x^2+1}$ is (A) $\frac{1}{t^2}$ (B) $\frac{t^2+1}{t^2}$ (C) $\frac{2t}{(t^2+1)^2}$ (D) 1

47. Which of these is not correct? (A) $\frac{d}{dx}(-\csc x) = \csc x \cot x$ (B) $\frac{d}{dx}(\tan x) = \sec^2 x$ (C) $\frac{d}{dx}(\cot x) = -\csc^2 x$ (D) $\frac{d}{dx}(\sec x) = \tan x \sec^2 x$

48. If $y = \sin x$, then $\frac{d^2y}{dx^2}$ is (A) $y(1+y)$ (B) $y(1+2y^2)$ (C) $2y^2(1+y)$ (D) $2y(y^2+1)$

49. Evaluate $\int \ln x dx$ (A) $x(\ln x - 1) + c$ (B) $(x+1)(\ln x) + c$ (C) $\frac{1}{x} + c$ (D) $\ln x + c$

50. Find the definite integral $\int (2x+1)^{\frac{5}{2}}$ (A) $\frac{1}{7}(2x+1)^{\frac{2}{7}}$ (B) $\frac{1}{7}(2x+1)^{\frac{7}{2}}$ (C) $7(2x+1)^{\frac{2}{5}}$ (D) $\frac{5}{2}(2x+1)^{\frac{2}{7}}$

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1	A	B	C	D	E	11	A	B	C	D	E	21	A	B	C	D	E	31	A	B	C	D	E	41	A	B	C	D	E
2	A	B	C	D	E	12	A	B	C	D	E	22	A	B	C	D	E	32	A	B	C	D	E	42	A	B	C	D	E
3	A	B	C	D	E	13	A	B	C	D	E	23	A	B	C	D	E	33	A	B	C	D	E	43	A	B	C	D	E
4	A	B	C	D	E	14	A	B	C	D	E	24	A	B	C	D	E	34	A	B	C	D	E	44	A	B	C	D	E
5	A	B	C	D	E	15	A	B	C	D	E	25	A	B	C	D	E	35	A	B	C	D	E	45	A	B	C	D	E
6	A	B	C	D	E	16	A	B	C	D	E	26	A	B	C	D	E	36	A	B	C	D	E	46	A	B	C	D	E
7	A	B	C	D	E	17	A	B	C	D	E	27	A	B	C	D	E	37	A	B	C	D	E	47	A	B	C	D	E
8	A	B	C	D	E	18	A	B	C	D	E	28	A	B	C	D	E	38	A	B	C	D	E	48	A	B	C	D	E
9	A	B	C	D	E	19	A	B	C	D	E	29	A	B	C	D	E	39	A	B	C	D	E	49	A	B	C	D	E
10	A	B	C	D	E	20	A	B	C	D	E	30	A	B	C	D	E	40	A	B	C	D	E	50	A	B	C	D	E

Sample: Valid	1	A	B	■	D	E	***Invalid***	1	A	✘	C	D	E	1	A	B	✓	D	E	1	A	B	C	Ⓓ	E