

CUET (UG) – MATHEMATICS

Chapter Test - Unit III: Calculus - Differential Equations

General Instructions

1. Total Questions: **20**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Each question carries **5 marks**.
5. For each correct answer: **+5 marks**.
6. For each incorrect answer: **-1 mark**.
7. No negative marking for unanswered questions.
8. Use of calculator or electronic devices is strictly prohibited.
9. Choose the most appropriate answer from the given options.

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1. The degree of the differential equation $\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 = x^2 \log\left(\frac{d^2y}{dx^2}\right)$ is:
(A) 1
(B) 2
(C) 3
(D) Not defined
2. The order of the differential equation of all circles of radius r is:
(A) 1
(B) 2
(C) 3
(D) 4
3. The solution of $\frac{dy}{dx} = \frac{ax+g}{by+f}$ represents a circle if:
(A) $a = b$
(B) $a = -b$
(C) $a = 2b$
(D) a and b are any constants
4. The general solution of $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$ is:
(A) $\sin^{-1} x + \sin^{-1} y = C$
(B) $\sin^{-1} x - \sin^{-1} y = C$
(C) $\sin^{-1} y = C \sin^{-1} x$
(D) $x\sqrt{1-y^2} + y\sqrt{1-x^2} = C$
5. The integrating factor of $\cos x \frac{dy}{dx} + y \sin x = 1$ is:
(A) $\cos x$
(B) $\tan x$
(C) $\sec x$
(D) $\sin x$
6. If $\frac{dy}{dx} = e^{-2y}$ and $y = 0$ when $x = 5$, then the value of y for $x = 3$ is:
(A) e^5
(B) $\frac{1}{2} \log 3$
(C) $\frac{1}{2} \log 5$
(D) $-\frac{1}{2} \log 5$
7. The differential equation $y \frac{dx}{dy} = x + 2y^2$ is:
(A) Linear in y
(B) Linear in x
(C) Homogeneous
(D) Variable separable
8. The general solution of $(x^2 - yx^2)dy + (y^2 + xy^2)dx = 0$ is:
(A) $\log |xy| + \frac{1}{x} - \frac{1}{y} = C$
(B) $\log |x/y| + \frac{1}{x} + \frac{1}{y} = C$
(C) $\log |xy| - \frac{1}{x} + \frac{1}{y} = C$
(D) $\log |xy| + x - y = C$
9. The number of solutions of $\frac{dy}{dx} = \frac{y+1}{x-1}$ when $y(1) = 2$ is:
(A) None
(B) One
(C) Two
(D) Infinite

10. Which substitution will solve the equation $\frac{dy}{dx} = \frac{y^2+xy}{x^2}$?
- (A) $x = vy$
(B) $y = vx$
(C) $y^2 = vx$
(D) $x + y = v$
11. The general solution of $\frac{dy}{dx} + \frac{y}{x} = \sin x$ is:
- (A) $xy = \cos x + C$
(B) $xy = -\cos x + C$
(C) $y = -x \cos x + C$
(D) $xy = \sin x + C$
12. The differential equation representing the family of curves $y = e^x(A \cos x + B \sin x)$ is:
- (A) $y'' - 2y' + 2y = 0$
(B) $y'' + 2y' - 2y = 0$
(C) $y'' - y = 0$
(D) $y'' - 2y' + y = 0$
13. The particular solution of $\frac{dy}{dx} = y \tan x$ given $y(0) = 1$ is:
- (A) $y = \cos x$
(B) $y = \sec x$
(C) $y = \sin x$
(D) $y = e^{\tan x}$
14. The solution of $(x + y + 1)\frac{dy}{dx} = 1$ is:
- (A) $x = Ce^y - y - 2$
(B) $y = Ce^x - x - 2$
(C) $x = Ce^y + y + 2$
(D) $x = e^y - y - 1$
15. The order and degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^2 - 3\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^4 = y^7$ are:
- (A) 3, 2
(B) 2, 3
(C) 3, 4
(D) 7, 2
16. The integrating factor of $x\frac{dy}{dx} + 2y = x^2 \log x$ is:
- (A) x
(B) x^2
(C) e^x
(D) $\log x$
17. The general solution of $x^2 dy + y(x + y)dx = 0$ is:
- (A) $x^2 y = C(2x + y)$
(B) $xy^2 = C(x + 2y)$
(C) $y = x \log |Cx|$
(D) $x/y + \log |x| = C$
18. The differential equation of the family of parabolas having vertex at origin and axis along positive y-axis is:
- (A) $x\frac{dy}{dx} = 2y$
(B) $y\frac{dx}{dy} = 2x$
(C) $\frac{dy}{dx} = 2xy$
(D) $x^2 = 4ay$

19. The general solution of $\frac{dy}{dx} = 1 + x + y + xy$ is:

(A) $\log|1 + y| = x + \frac{x^2}{2} + C$

(B) $\log|1 + x| = y + \frac{y^2}{2} + C$

(C) $1 + y = e^{x+x^2}$

(D) $y = x^2 + x + C$

20. The value of m for which $y = e^{mx}$ is a solution of $y'' - 5y' + 6y = 0$ is:

(A) 1 or 6

(B) 2 or 3

(C) -2 or -3

(D) 0 or 5

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