DPP No: 36

Maximum Time 50 Min

MATHS

TARGET JEE-MAIN

SYLLABUS : DIFFERENTIAL EQUATION

1. The degree and order of the differential equation of all the parabolas whose axis is x–axis are

(A) 2, 1 (B) 1, 2 (C) 3, 2 (D) none of these

2. The solution of the differential equation $\left(e^{-2\sqrt{x}} - \frac{y}{\sqrt{x}}\right)\frac{dx}{dy} = 1$ is given by

(A) $ye^{2\sqrt{x}} = x + c$ (B) $ye^{-2\sqrt{x}} = \sqrt{x} + c$ (C) $y = \sqrt{x}$ (D) $y = 3\sqrt{x}$

3. The solution of the differential equation $\frac{dy}{dx} = \frac{1}{x + y^2}$ is {where C is an arbitrary constant).

(A) $y = -x^2 - 2x - 2 + ce^x$ (B) $y = x^2 + 2x + 2 - ce^x$

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

4. The integrating factor of the differential equation $\frac{dy}{dx} + \frac{y}{(1-x)\sqrt{x}} = 1 - \sqrt{x}$ may be

(A) $\frac{1-\sqrt{x}}{1+\sqrt{x}}$ (B) $\frac{1+\sqrt{x}}{1-\sqrt{x}}$ (C) $\frac{1-x}{1+x}$ (D) $\frac{\sqrt{x}}{1-\sqrt{x}}$

5. If $x\frac{dy}{dx} = y(\log y - \log x + 1)$, then the solution of the equation is

(A) $\log\left(\frac{x}{y}\right) = cy$ (B) $\log\left(\frac{y}{x}\right) = cx$ (C) $x\log\left(\frac{y}{x}\right) = cy$ (D) $y\log\left(\frac{x}{y}\right) = cx$

6. The solution of the differential equation $\frac{dy}{dx} = \frac{x+y}{x}$ satisfying the condition y (1) = 1 is

(A) $y = \log x + x$ (B) $y = x\log x + x^2$ (C) $y = xe^{(x-1)}$ (D) $y = x\log x + x$

7. If $\frac{dy}{dx} = 1 + x + y + xy$ and y (– 1) = 0, then function y is

(A) $e^{(1-x)^2/2}$ (B) $e^{(1+x)^2/2} - 1$ (C) $\log_e(1 + x) - 1$ (D) $1 + x$

8. The solution of $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$ is

(A) $\sin^{-1} x \sin^{-1} y = C$ (B) $\sin^{-1} x = C \sin^{-1} y$

(C) $\sin^{-1} x - \sin^{-1} y = C$ (D) $\sin^{-1}x + \sin^{-1} y = C$

9. Solution of differential equation xdy – y dx = 0 represents :

(A) rectangular hyperbola (B) straight line passing through origin

(C) parabola whose vertex is at origin (D) circle whose centre is at origin

10. The slope of a curve at any point is the reciprocal of twice the ordinate at that point and it passes through the point (4, 3). The equation of the curve is

(A) $x^2 = y + 5$ (B) $y^2 = x - 5$ (C) $y^2 = x + 5$ (D) $x^2 = y + 5$

11. Solution of differential equation $x(xdx - ydy) = 4\sqrt{x^2 - y^2}\,(xdy - ydx)$ is

(A) $\sqrt{x^2 - y^2} = Ae^{4\sin^{-1}\left(\frac{x}{y}\right)}$ (B) $\sqrt{x^2 + y^2} = Ae^{4\cos^{-1}x}$

(C) $\sqrt{x^2 - y^2} = Ae^{4\tan^{-1}\left(\frac{y}{x}\right)}$ (D) $\sqrt{x^2 - y^2} = Ae^{4\sin^{-1}\left(\frac{y}{x}\right)}$

12. The solution of the differential equation $f'(x) = f(x) - \ln x + \frac{1}{x}$, is

(A) $f(x) = x \ln x + c$ (B) $f(x) = e^x \ln x + c$
(C) $f(x) = \ln x + ce^x$ (D) $f(x) = x^2 \ln x + c$

13. Solution of differential equation of $(x + 2y^3)\, dy = ydx$ is

(A) $x = y^3 + cy$ (B) $y = x^3 + cx$ (C) $x^2 + y^2 = cxy$ (D) none of these

14. The solution of $\frac{dv}{dt} + \frac{k}{m}v = -g$ is

(A) $v = ce^{-\frac{k}{m}t} - \frac{mg}{k}$ (B) $v = c - \frac{mg}{k}e^{-\frac{k}{m}t}$ (C) $v\,e^{-\frac{k}{m}t} = c - \frac{mg}{k}$ (D) $v\,e^{\frac{k}{m}t} = c - \frac{mg}{k}$

15. Solution of the differential equation $\cos x\, dy = y(\sin x - y)\, dx$, $0 < x < \frac{\pi}{2}$ is

(A) $y \sec x = \tan x + c$ (B) $y \tan x = \sec x + c$
(C) $\tan x = (\sec x + c)y$ (D) $\sec x = (\tan x + c)\, y$

16. Solution of $\left(\frac{dy}{dx}\right)^2 + x\frac{dy}{dx} - y = 0$ is

(A) $y = 3x^2 + 9$ (B) $y = 3x + 9$ (C) $y = \frac{4}{3}x^2$ (D) $y = 9x + 3$

17. Solution of differential equation $xe^{-\frac{y}{x}}dy - \left(ye^{-\frac{y}{x}} + x^3\right)dx = 0$ is

(A) $e^{-\frac{y}{x}} + x^2 = C$ (B) $2e^{-\frac{y}{x}} + x^2 = C$

(C) $e^{-\frac{y}{x}} + 2x^2 = C$ (D) $2e^{-\frac{y}{x}} - x^2 = C$

18. The population of a country increases at a rate proportional to the number of inhabitants. If the population doubles in 30 years, find after how many years the population will triple–

(A) 12 (B) 24 (C) 36 (D) 48

19. The real value of m for which the substitution $y = u^m$ will transform the differential equation $2x^4y\frac{dy}{dx} + y^4 = 4x^6$ in to a homogeneous equation is

(A) m = 0 (B) m = 1 (C) m = 3/2 (D) m = 2/3

20. Let I be the purchase value of an equipment and V(t) be the value after it has been used for t years. The value V(t) depreciates at a rate given by differential equation $\frac{dV(t)}{dt} = -k(T-t)$, where k > 0 is a constant and T is the total life in years of the equipment. Then the scrap value V(T) of the equipment is :

(A) $T^2 - \frac{1}{k}$ (B) $I - \frac{kT^2}{2}$ (C) $I - \frac{k(T-t)^2}{2}$ (D) e^{-kT}

21. If $\frac{dy}{dx} = y + 3 > 0$ and y(0) = 2, then y(ℓn2) is equal to :

(A) 7 (B) 5 (C) 13 (D) –2

22. The curve that passes through the point (2, 3), and has the property that the segment of any tangent to it lying between the coordinate axes is bisected by the point of contact is given by :

(A) 2y – 3x = 0 (B) $y = \frac{6}{x}$ (C) $x^2 + y^2 = 13$ (D) $\left(\frac{x}{2}\right)^2 + \left(\frac{y}{3}\right)^2 = 2$

23. Consider the differential equation $y^2dx + \left(x - \frac{1}{y}\right)dy = 0$. If y (1) = 1, then x is given by :

(A) $4 - \frac{2}{y} - \frac{e^{\frac{1}{y}}}{e}$ (B) $3 - \frac{1}{y} + \frac{e^{\frac{1}{y}}}{e}$ (C) $1 + \frac{1}{y} - \frac{e^{\frac{1}{y}}}{e}$ (D) $1 - \frac{1}{y} + \frac{e^{\frac{1}{y}}}{e}$

24. The population p(t) at time t of a certain mouse species satisfies the differential equation $\frac{dp(t)}{dt} = 0.5\,p(t) - 450$. If p(0) = 850, then the time at which the population becomes zero is :

(A) 2 ℓn 18 (B) ℓn 9 (C) $\frac{1}{2}$ ℓn 18 (D) ℓn 18

25. Let the population of rabbits surviving at a time t be governed by the differential equation $\frac{dp(t)}{dt} = \frac{1}{2}\,p(t) - 200$. If p(0) = 100, then p(t) equals :

(A) $600 - 500\,e^{t/2}$ (B) $400 - 300\,e^{-t/2}$ (C) $400 - 300\,e^{t/2}$ (D) $300 - 200\,e^{-t/2}$

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ANSWER KEY OF DPP NO. : 36

1.	**(B)**	**2.**	**(A)**	**3.**	**(D)**	**4.**	**(B)**	**5.**	**(B)**	**6.**	**(D)**	**7.**	**(B)**
8.	**(D)**	**9.**	**(B)**	**10.**	**(C)**	**11.**	**(D)**	**12.**	**(C)**	**13.**	**(A)**	**14.**	**(A)**
15.	**(D)**	**16.**	**(B)**	**17.**	**(B)**	**18.**	**(D)**	**19.**	**(C)**	**20.**	**(B)**	**21.**	**(A)**
22.	**(B)**	**23.**	**(C)**	**24.**	**(A)**	**25.**	**(C)**						