2008 Delhi

1. Solve the differential equation: $(x^2 - y^2)dx + 2xydy = 0$, given that y = 1, when x = 1.
2. Solve the differential equation: $\frac{dy}{dx} = \frac{x(2y - x)}{x(2y + x)}$, given that y = 1, when x = 1.
3. Solve the differential equation: $\cos^2 x \frac{dy}{dx} + y = \tan x$
4. Solve the differential equation: $\frac{dy}{dx} + \sec^2 x\, y = \tan x \sec^2 x$.

2008 Foreign

5. Solve the differential equation : $x^2\, ydx - (x^3 + y^3)\, dy = 0$
6. Solve the differential equation: $\cos x \frac{dy}{dx} + y = \sin x$.

2009 Delhi

7. Solve the differential equation: $\frac{dy}{dx} + y = \cos x - \sin x$
8. Find the particular solution for the differential equation: $\frac{dy}{dx} - \frac{y}{x} + \operatorname{cosec}\left(\frac{y}{x}\right) = 0$; y = 0 when x = 1
9. Solve the differential equation: $\left(1 + x^2\right)\frac{dy}{dx} + y = \tan^{-1} x$
10. Solve the differential equation: $x \log x \frac{dy}{dx} + y = 2 \log x$

2009 AI

11. Solve the differential equation: $x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right)$
12. Solve the differential equation: $\cos^2 x \frac{dy}{dx} + y = \tan x$
13. Form the differential equation of the family of circles touching the y – axis at origin.
14. Form the differential equation representing the family of curves given by $(x - a)^2 + 2y^2 = a^2$, where a is an arbitrary constant.

2009 Foreign

15. Solve :$(x^3 + y^3)\, dy - x^2\, ydx = 0$
16. Find the particular solution for the differential equation $\frac{dy}{dx} + y\cot x = 4x\operatorname{cosec} x, (x \neq 0)$; y = 0 when x = $\frac{\pi}{2}$
17. Solve the differential equation: $\left(x^2 - 1\right)\frac{dy}{dx} + 2xy = \frac{2}{x^2 - 1}$
18. For the differential equation $xy\frac{dy}{dx} = (x + 2)(y + 2)$, find the solution curve passing through the point (1, -1).

2010 Delhi

19. Find the general solution of the differential equation $x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x$
20. Find the particular solution for the differential equation: $\frac{dy}{dx} = y \tan x$, given that y = 1 when x = 0.
21. Find the particular solution for the differential equation: $x^2 dy + \left(xy + y^2\right)dx = 0$, given that y = 1 when x = 1.

2010 AI

22. Solve the differential equation: $\left(x^2-1\right)\frac{dy}{dx}+2xy=\frac{1}{x^2-1}$

23. Solve the differential equation: $\sqrt{1+x^2+y^2+x^2y^2}+xy\frac{\mathrm{dy}}{\mathrm{dx}}=0$

24. Show that the differential equation $\left(x-y\right)\frac{dy}{dx}=x+2y$, is homogenous and solve it.

25. Solve $ydx+x\log\left(\frac{y}{x}\right)dy-2xdy=0$

26. Solve : $\left(x^2+1\right)\frac{dy}{dx}+2xy=\sqrt{x^2+4}$

27. Solve : $\left(x^3+x^2+x+1\right)\frac{\mathrm{dy}}{\mathrm{dx}}=2x^2+x$

2010 Foreign

28. Form the differential equation representing the family of ellipses having foci on x – axis and centre at the origin.

29. Find the particular solution of the differential equation $\left(3x^2+y\right)\frac{dy}{dx}=x, x>0$ when x =1, y = 1.

30. Solve $ydx+x\log\left(\frac{y}{x}\right)dy=2xdy$

2011 Delhi

31. Solve : $e^x\tan y.dx+\left(1-e^x\right)\sec^2 y\,dy=0$

32. Solve the differential equation: $\cos^2 x\frac{dy}{dx}+y=\tan x$

2011 Foreign

33. (All Sets)Find the particular solution of the differential equation:
$\left(1+e^{2x}\right)dy+\left(1+y^2\right)e^x dx=0$ given that y =1, when x = 0.

34. (Set 1) Solve the differential equation: $\frac{dy}{dx}+y\cot x=4x\,\mathrm{cosec}x,(x\neq 0)$; given that y = 0 when x = $\frac{\pi}{2}$.

35. (Set 2) Solve the differential equation: $\frac{dy}{dx}+2y\tan x=\sin x$, given that y = 0, when x = $\frac{\pi}{3}$.

36. (Set 3) Solve the differential equation: $\left(1+x^2\right)\frac{dy}{dx}+2xy=\frac{1}{1+x^2}$, given y = 0 when x = 1.