Differential Equations and its Applications(MAT 331)

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Practice Problems: Set I

Topic 1: Simultaneous Differential Equations of the form $\dfrac{dx}{P} = \dfrac{dy}{Q} = \dfrac{dz}{R}$

where P,Q, R are functions of x, y and z.

SOLVE THE FOLLOWING

1. $\dfrac{dx}{y-z} = \dfrac{dy}{z-x} = \dfrac{dz}{x-y}$

2. $\dfrac{dx}{x(y-z)} = \dfrac{dy}{y(z-x)} = \dfrac{dz}{z(x-y)}$

3. $\dfrac{dx}{mz-ny} = \dfrac{dy}{nx-lz} = \dfrac{dz}{ly-mx}$

4. $\dfrac{dx}{mn(y-z)} = \dfrac{dy}{nl(z-x)} = \dfrac{dz}{lm(x-y)}$

5. $\dfrac{dx}{x(y^2-z^2)} = \dfrac{dy}{y(z^2-x^2)} = \dfrac{dz}{z(x^2-y^2)}$

6. $\dfrac{dx}{b-c} = \dfrac{dy}{c-a} = \dfrac{dz}{a-b}$

7. $\dfrac{dx}{(b-c)yz} = \dfrac{dy}{(c-a)zx} = \dfrac{dz}{(a-b)xy}$

8. $\dfrac{dx}{x(y^2-z^2)} = \dfrac{dy}{-y(z^2+x^2)} = \dfrac{dz}{z(x^2+y^2)}$

9. $\dfrac{dx}{x(2y^4-z^4)} = \dfrac{dy}{y(z^4-2x^4)} = \dfrac{dz}{z(x^4-y^4)}$

10. $\dfrac{dx}{z(x+y)} = \dfrac{dy}{z(x-y)} = \dfrac{dz}{x^2+y^2}$

11. $\dfrac{dx}{y-zx} = \dfrac{dy}{x+yz} = \dfrac{dz}{x^2+y^2}$

12. $\dfrac{dx}{yz} = \dfrac{dy}{zx} = \dfrac{dz}{yz}$

13. $\dfrac{xdx}{yz} = \dfrac{dy}{xz} = \dfrac{dz}{yz}$

14. $\dfrac{dx}{x^2-y^2-z^2} = \dfrac{dy}{2xy} = \dfrac{dz}{2xz}$

15. $\dfrac{dx}{y} = \dfrac{dy}{-x} = \dfrac{dz}{2x - 3y}$

16. $\dfrac{dx}{x^2} = \dfrac{dy}{y^2} = \dfrac{dz}{nxy}$

17. $\dfrac{dx}{y^2} = \dfrac{dy}{x^2} = \dfrac{dz}{x^2 y^2 z^2}$

18. $\dfrac{dx}{zy^2} = \dfrac{dy}{zx^2} = \dfrac{dz}{xy^2}$

19. $\dfrac{dx}{xy} = \dfrac{dy}{y^2} = \dfrac{dz}{zxy - 2x^2}$

20. $\dfrac{dx}{z} = \dfrac{dy}{-z} = \dfrac{dz}{z^2 + (y + x)^2}$

21. $\dfrac{dx}{z^2 - 2yz - y^2} = \dfrac{dy}{y + z} = \dfrac{dz}{y - z}$

22. $\dfrac{dx}{1} = \dfrac{dy}{-2} = \dfrac{dz}{3x^2 \sin(y + 2x)}$

23. $\dfrac{dx}{1} = \dfrac{dy}{3} = \dfrac{dz}{5z + \tan(y - 3x)}$

24. $\dfrac{dx}{xz(z^2 + xy)} = \dfrac{dy}{-yz(z^2 + xy)} = \dfrac{dz}{x^4}$

25. $\dfrac{dx}{y} = \dfrac{dy}{x} = \dfrac{dz}{xyz^2(x^2 - y^2)}$

26. $\dfrac{dx}{-x(x + y)} = \dfrac{dy}{y(x + y)} = \dfrac{dz}{(x - y)(2x + 2y + z)}$

27. $\dfrac{dx}{x^2 - y^2 - yz} = \dfrac{dy}{x^2 - y^2 - zx} = \dfrac{dz}{z(x - y)}$

28. $\dfrac{dx}{y + z} = \dfrac{dy}{z + x} = \dfrac{dz}{x + y}$

29. $\dfrac{dx}{1 + y} = \dfrac{dy}{1 + x} = \dfrac{dz}{z}$

30. $\dfrac{dx}{x^2 - yz} = \dfrac{dy}{y^2 - zx} = \dfrac{dz}{z^2 - xy}$

31. $\dfrac{yz\,dx}{y - z} = \dfrac{zx\,dy}{z - x} = \dfrac{xy\,dz}{x - y}$

32. $\dfrac{dx}{bz - cy} = \dfrac{dy}{cx - az} = \dfrac{dz}{ay - bx}$

33. $$\frac{dx}{y^2 + z^2 - x^2} = \frac{dy}{-2xy} = \frac{dz}{-2xz}$$

34. $$\frac{dx}{xz} = \frac{dy}{yz} = \frac{dz}{xy}$$

35. $$\frac{dx}{x^2(y - z)} = \frac{dy}{y^2(z - x)} = \frac{dz}{z^2(x - y)}$$

36. $$\frac{dx}{y^2} = \frac{dy}{-xy} = \frac{dz}{x(z - 2y)}$$

37. $$\frac{dx}{x(y^2 + z)} = \frac{dy}{-y(x^2 + z)} = \frac{dz}{z(x^2 - y^2)}$$

38. $$\frac{dx}{x^2 + y^2 + yz} = \frac{dy}{x^2 + y^2 - zx} = \frac{dz}{z(x + y)}$$

39. $$\frac{dx}{x^2 - y^2 - yz} = \frac{dy}{x^2 - y^2 - zx} = \frac{dz}{z(x - y)}$$

40. $$\frac{dx}{x^2} = \frac{dy}{y^2} = \frac{dz}{z^2}$$

41. $$\frac{xdx}{y^2z} = \frac{dy}{zx} = \frac{dz}{y^2}$$

42. $$\frac{dx}{z^2 - 2yz - y^2} = \frac{dy}{xy + zx} = \frac{dz}{xy - zx}$$

43. $$\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{\sqrt{x^2 + y^2}}$$

44. $$\frac{dx}{y - zx} = \frac{dy}{x + yz} = \frac{dz}{x^2 + y^2}$$

45. $$\frac{dx}{x + 2z} = \frac{dy}{4xz - y} = \frac{dz}{2x^2 + y}$$

46. $$\frac{dx}{y^3x - 2x^4} = \frac{dy}{2y^4 - x^3y} = \frac{dz}{9z(x^3 - y^3)}$$

47. $$\frac{dx}{x(2y^4 - z^4)} = \frac{dy}{y(z^4 - 2x^4)} = \frac{dz}{z(x^4 - y^4)}$$

48. $$\frac{dx}{z^2 - 2yz - y^2} = \frac{dy}{y + z} = \frac{dz}{y - z}$$

49. $$\frac{dx}{x - y} = \frac{dy}{x + y} = \frac{dz}{2xz}$$

50. $$\frac{dx}{x(x^2 + 3y^2)} = \frac{dy}{-y(3x^2 + y^2)} = \frac{dz}{2z(y^2 - x^2)}$$