Concepts and Formulas to Remember :

- Differential Equations

1. $xdy + ydx = d(xy)$

2. $d(x + y) = dx + dy$

3. $d\left(\dfrac{y}{x}\right) = \dfrac{x\,dy - y\,dx}{x^2}$

4. $d\left(\dfrac{x}{y}\right) = \dfrac{y\,dx - x\,dy}{y^2}$

5. $d\left(\dfrac{x^2}{y}\right) = \dfrac{2xy\,dx - x^2\,dy}{y^2}$

6. $d\left(\dfrac{y^2}{x}\right) = \dfrac{2xy\,dy - y^2\,dx}{x^2}$

7. $d\left(\dfrac{x^2}{y^2}\right) = \dfrac{2xy^2\,dx - 2x^2y\,dy}{y^4}$

8. $d\left(\dfrac{y^2}{x^2}\right) = \dfrac{2x^2y\,dy - 2xy^2\,dx}{x^4}$

9. $\dfrac{xdy + ydx}{xy} = d(\log xy)$

10. $\dfrac{ydx - xdy}{xy} = d\left(\log\dfrac{x}{y}\right)$

11. $\dfrac{xdy - ydx}{xy} = d\left(\log\dfrac{y}{x}\right)$

12. $\dfrac{dx + dy}{x + y} = d\log(x + y)$

13. $\dfrac{xdx + ydy}{x^2 + y^2} = d\left(\log\sqrt{x^2 + y^2}\right)$

14. $\dfrac{xdy - ydx}{x^2 + y^2} = d\left(\tan^{-1}\dfrac{y}{x}\right)$

15. $\dfrac{ydx - xdy}{x^2 + y^2} = d\left(\tan^{-1}\dfrac{x}{y}\right)$

16. $d\left(\dfrac{-1}{xy}\right) = \dfrac{xdy + ydx}{x^2 y^2}$

17. $d\left(\dfrac{e^x}{y}\right) = \dfrac{ye^x\,dy - e^x\,dy}{y^2}$

18. $d\left(\dfrac{e^y}{x}\right) = \dfrac{xe^y\,dy - e^y\,dx}{x^2}$

19. $d(\sqrt{x^2 + y^2}) = \dfrac{xdx + ydy}{\sqrt{x^2 + y^2}}$

20. $d(x^m\, y^n) = x^{m-1} \cdot y^{n-1}(my\,dx + nx\,dy)$

21. $d\left(\dfrac{1}{2}\log\dfrac{x + y}{x - y}\right) = \dfrac{xdy - ydx}{x^2 - y^2}$

22. $\dfrac{d[f(x,y)]^{1-n}}{1 - n} = \dfrac{f'(x,y)}{[f(x,y)]^n}$

23. $d\left(\dfrac{1}{y} - \dfrac{1}{x}\right) = d\left(\dfrac{1}{y}\right) - d\left(\dfrac{1}{x}\right) = \dfrac{dx}{x^2} - \dfrac{dy}{y^2}$