Assignment Questions 3rd and 4th units

1. Solve $\left(1+e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right)dy = 0$

2. Solve $\dfrac{dy}{dx} = \dfrac{y^3 + 3x^2 y}{x^3 + 3xy^2}$

3. Solve $(3y + 2x + 4)dx - (4x + 6y + 5)dy = 0$

4. Solve $\dfrac{dy}{dx} + \dfrac{y\cos x + \sin y + y}{\sin x + x\cos y + x} = 0$

5. Solve $2xy\,dy - (x^2 - y^2 + 1)dx = 0$

6. Solve $y^2 dx + (x^2 - xy - y^2)dy = 0$

7. Solve $(xy\sin xy + \cos xy)\,y\,dx + (xy\sin xy - \cos xy)x\,dy = 0$

8. Solve $2xy\,dy - (x^2 + y^2 + 1)dx = 0$

9. Solve $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$

10. Solve $(x+1)\dfrac{dy}{dx} - y = e^{3x}(x+1)^2$

11. Solve $x\dfrac{dy}{dx} + y = x^2 y^6$

12. Solve $\dfrac{dy}{dx} + y\,Tanx = y^2 \sec x$

13. Solve $\dfrac{dy}{dx} - \dfrac{Tan\,y}{1+x} = (1+x)e^x \sec y$

14. Show that the system of confocal conics $\dfrac{x^2}{a^2 + \lambda} + \dfrac{y^2}{b^2 + \lambda} = 1$, where λ is a parameter, is self orthogonal.

15. Prove that the system of parabolas $y^2 = 4a(x+a)$ is self orthogonal

16. Find the orthogonal trajectories of the family of curves $r^n = a^n \cos n\theta$

17. A body kept in air with temperature 25^0C cools from 140^0C to 80^0C in 20 minutes. Find when the body cools down to 35^0C

18. If the temperature of the air is 20^0 Cand the temperature of the body drops from 100^0C to 80^0 C in 10 minutes. What will be its temperature after 20 minutes. When will be the temperature 40^0C.

19. If radioactive carbon 14 has a half-life of 5750 years, what will remain of one gram after 3000 years.

20. Solve $(4D^2 - 4D + 1)y = 100$

21. Solve $(D^2 - 3D + 2)y = \cos hx$

22. Solve $(D^2 - 4)y = 2\cos^2 x$

23. Solve $(D^2 + 1)y = \sin x \sin 2x$

24. Solve $(D^2 + 9)y = \cos 3x + \sin 2x$

25. Solve $(D^2 + 3D + 2)y = 2\cos(2x+3) + 2e^x + x^2$

26. Solve $(D^2 - 2D + 1)y = x^2 e^{3x} - \sin 2x + 3$

27. Solve $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$

28.   Apply variation of parameter method to solve

   a) $(D^2 + a^2)y = \sec ax$ b) $(D^2 - 2D + 2)y = e^x \tan x$ c) $(D^2 + 1)y = x \sin x$

29.   Solve

   a) $x^2 \dfrac{d^2 y}{dx^2} + 2x \dfrac{dy}{dx} - 20y = (x+1)^2$ b) $x^2 \dfrac{d^2 y}{dx^2} + x \dfrac{dy}{dx} + y = \log x \sin(\log x)$