# FAQ's

1. **Solve the system of equations**
   **(D-1)x+Dy=2t+1……………..(1)**
   **(2D+1)x+2Dy=t…………….(2)**
   Solution:
   Subtracting twice equ(1) from (2) we have 3x=3t-2.
   Substituting $x = -t - \frac{2}{3}$ in (1) we obtain $D_y$=2t+1-(D-1)x=$t + \frac{4}{3}$ and
   y=$\frac{1}{2}t^2 + \frac{4}{3}t + c_1$
2. **Solve ($x^3D^3+3x^2D^2$-2xD+2)y=0**
   Solution:
   The transformation $x = e^z$ reduces the equation to {D(D-1)(D-2)+3D(D-1)-2D+2}y=($D^3$-3D+2)y=0
   Whose solution is $y = c_1e^z + c_2ze^z + c_3e^{-2z}$ since z=ln x, the complete solution of the given equation is $y = c_1(x) + c_2(x)\ln x + \frac{c_3}{x^2}$
3. **In the differential equation of the form F(D)y=Q if Q is of the form $e^{ax}$ how the particular integral in obtained?**
   Solution:
   If Q is of the form $e^{ax}$
   $$y = \frac{1}{F(D)}e^{ax} = \frac{1}{F(a)}e^{ax}, F(a) \neq 0$$

4. **Give the Cauchy linear equations.**
   Solution:
   The Cauchy linear equation is
   $$p_0x^n\frac{d^ny}{dx^n} + p_1x^{n-1}\frac{d^{n-1}y}{dx^{n-1}} + p_2x^{n-2}\frac{d^{n-2}y}{dx^{n-2}} + \text{………....}p_{n-1}x\frac{dy}{dx} + p_ny = Q(x)$$
   in which $p_0$, $p_1$,$p_2$………………..$p_n$ are constants.

**5. Give the Legendre linear equation.**

Solution:

The Legendre linear equation is

$$p_0(ax+b)^n \frac{d^n y}{dx^n} + p_1(ax+b)^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots\dots\dots\dots$$

$$+ p_{n-1}(ax+b)\frac{dy}{dx} + p_n y = Q(x)$$