FAQ's

1. **Define homogeneous linear differential equations.**

   An nth order linear differential equations has the form $b_n(x)y^{(n)}+ b_{n-1}(x)y^{(n-1)}+\ldots\ldots b_2(x)y''+ b_1(x)y'+ b_0(x)y=g(x)$ where g(x) and the co-efficients $b_j(x)$ (j=0, 1, 2,…….n) depend solely on the variable x. If $g(x)\equiv 0$ then this equation is homogeneous.

2. **What do you mean linearly dependent solutions?**

   A set of function $\{y_1(x), y_2(x),\ldots\ldots y_n(x)\}$ is linearly dependent on $a \le x \le b$ if there exists constants $c_1, c_2,\ldots\ldots c_n$ not all zero such that $c_1y_1(x)+ c_2y_2(x)+\ldots\ldots+ c_ny_n(x)=0$.

3. **Solve y''-y'-2y=0**

   The characteristics equation is $\lambda^2-\lambda-2=0$ which can be factored into $(\lambda+1)(\lambda-2)=0$.since the roots $\lambda_1=-1$ and $\lambda_2=2$ are real and distinct, the solution is given by $y=c_1e^{-x}+c_2e^{2x}$.

4. **Solve y''+4y=0**

   The characteristic equation is $\lambda^2+4\lambda=0$ which can be factored into $(\lambda-2i)(\lambda+2i)=0$.These roots are a complex conjugate pair, so the general solution is given by $y=c_1 \cos 2x+c_2 \sin 2x$.

5. **Solve y''=0**

   The characteristics equation is $\lambda^2=0$, which has roots $\lambda_1=\lambda_2=0$. The solution is given by $y=c_1e^{0x}+c_2xe^{0x} =c_1+xc_2$.