(1)

(1^{st} session)

$y = ce^{2x}$

$\frac{dy}{dx} - 2y = 0$ — (1)

$y' = \frac{d}{dx}y = 2ce^{2x}$

using in (1)

$\Rightarrow (2ce^{2x}) - 2(ce^{2x}) = 0$

$\cancel{2ce^{2x}} - \cancel{2ce^{2x}} = 0$

$0 = 0$

$y = A\cos x, \quad y'' + y = 0$

$y' = -A\sin x$

$y'' = -A\cos x$

$(-\cancel{A\cos x}) + \cancel{A\cos x} = 0$

$0 = 0$

$\cancel{y = B\cos}$

$y = B\sin x$, $y'' + y = 0$

$y = A_1\cos x + A_2\sin x$,

$y'' + y = 0$

general solution.

$y = 2\cos x + 3\sin x$

$y'' + y = 0$

particular solution

Formation of a Differential eq.

$$y = cx^2 \quad \text{--- (1)}$$

$$y' = 2cx \quad \text{--- (2)}$$

$$c = \frac{y'}{2x}$$

using value of "c" in Eq. (1)

$$\Rightarrow \quad y = \left(\frac{y'}{2\cancel{x}}\right)x^{\cancel{2}}$$

$$\Rightarrow \quad \boxed{y = \frac{1}{2}xy'}$$

or

$$\boxed{2y = x\frac{dy}{dx}}$$

4

1

$$y = mx \quad \text{--- } 1$$

$$y' = m \cdot 1 \quad \text{--- } 2$$

$$\Rightarrow \boxed{y = xy'}$$

2

$$y = mx + c \quad \text{--- } 1$$

$$\Rightarrow y' = m.$$

$$\Rightarrow \boxed{y'' = 0}$$

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(5)

$$x^2 + y^2 = a^2 \quad \text{--- (1)}$$

x^2

$2x^{2-1} \cdot 1$

$2x$

$$2x + 2y \cdot y' = 0$$

$$\cancel{2}\left[x + yy'\right] = 0$$

$$\boxed{x + yy' = 0}$$

$(x^n)'$

$= n x^{n-1} \cdot 1$

y^2

$= 2y^{2-1} \cdot y'$

$$y = c_1 \cos x + c_2 \sin x \quad \text{--- (1)}$$

$$\Rightarrow \quad y' = -c_1 \sin x + c_2 \cos x \quad \text{--- (2)}$$

and $$y'' = -c_1 \cos x - c_2 \sin x$$

$$y'' = -\left(c_1 \cos x + c_2 \sin x\right) \quad \text{--- (3)}$$

$$\Rightarrow \quad y'' = -y \text{ or } \boxed{y'' + y = 0}$$

(b)

$y = ax^2 + bx + c$ — (1)

$\Rightarrow y' = 2ax + b$

$\Rightarrow y'' = \underline{2a} + 0$

$\Rightarrow y''' = 0$

$x^2 + y^2 = 2gx$ — (1)

$\Rightarrow 2x + 2y \cdot y' = 2g$

$\cancel{2}[x + yy'] = \cancel{2}g$

$x + yy' = g$ — (2)

using Eq (2) in Eq (1)

$\Rightarrow x^2 + y^2 = 2(x + yy')x$

or $\boxed{x^2 + y^2 = 2x^2 + 2xyy'}$

$$(x-a)^2 + y^2 = a^2 \quad \text{—— (1)}$$

$$\Rightarrow \cancel{2}(x-a)^{1}.1. + \cancel{2}y.y' = 0$$

or $$x - a + yy' = 0$$

or $$x + yy' = a \quad \text{—— (2)}$$

Using value of 'a' in Eq. (1)

$$\Rightarrow [x-(x+yy')]^2 + y^2 = (x+yy')^2$$

$$(\cancel{x}-\cancel{x}-yy')^2 + y^2 = (x+yy')^2$$

$$\boxed{y^2 y'^2 + y^2 = (x+yy')^2}$$