Case(1) TOMORROW'S DISCUSSION.

Type 4: Non-homogeneous but reducible to homogeneous.

$$\frac{dy}{dx} = \frac{ax+by+c}{dx+e\cdot y+f} \quad -① \qquad \text{where } \frac{a}{d} \neq \frac{b}{e} \quad \text{or } ae \neq b\cdot d$$

then transformation

$$x = \underbrace{X}_{\text{new } x} + \underbrace{h}_{\text{unknown}} \quad \text{and} \quad y = \underbrace{Y}_{\text{new } y} + k \rightarrow \text{unknown constant} \quad -②$$

$$dx = dX \quad \text{and} \quad dy = dY \; ; \quad \frac{dy}{dx} = \frac{dY}{dX} \quad -③$$

From ① and ②

$$\frac{dY}{dX} = \frac{dy}{dx} = \frac{ax+by+c}{dx+ey+f} = \frac{a(X+h)+b(Y+k)+c}{d(X+h)+e(Y+k)+f}$$

$$\downarrow$$

$$\frac{dY}{dX} = \frac{aX+bY+(ah+bk+c)}{dX+eY+dh+ek+c} \qquad ah+bk+c=0, \quad dh+ek+c=0$$

solve for unknown h and k.

$\downarrow$

Now

$$\left.\frac{dY}{dX} = \frac{aX+bY}{dX+eY}\right\} \rightarrow \text{homogeneous.} \quad Z = \frac{Y}{X} \rightarrow Z(X) \rightarrow Y(X)$$

Case (2) if $ae = b\cdot d$

or $\frac{a}{d} = \frac{b}{e} = k$ (let it be)

then

$$\frac{dy}{dx} = \frac{k(dx+ey)+c}{(dx+ey)+f} = \frac{kz+c}{z+f}$$

let $z = dx+ey \Rightarrow \frac{dz}{dx} = d + e\cdot\frac{dy}{dx}$.

NOW SEPERABLE.