

Form: $y' + P(x)y = Q(x)$

5. $Xy' + 3y = \sin X, \quad X > 0$

① $\frac{Xy'}{X} + \frac{3y}{X} = \frac{\sin X}{X}$
 $y' + \frac{3}{X}y = \frac{\sin X}{X}$
 $\underbrace{\hspace{2em}}_{P(x)}$

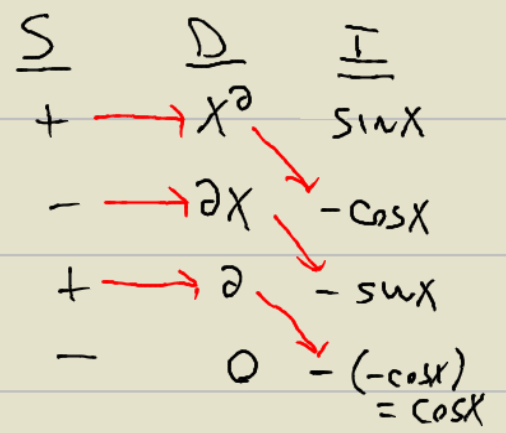
② I.F.
 $M(x) = e^{\int P(x) dx}$
 $= e^{\int \frac{3}{X} dx}$
 $= e^{3 \ln X}$
 $= e^{\ln X^3}$
 $= X^3$

③ $X^3(y' + \frac{3}{X}y) = X^3(\frac{\sin X}{X})$

$\underbrace{X^3}_{Q'} \underbrace{y'}_{P'} + \underbrace{3X^2}_{Q'} \underbrace{y}_{P} = X^2 \sin X$

④ $\frac{d}{dx} [yX^3] = X^2 \sin X$

⑤ $\int \frac{d}{dx} [yX^3] dx = \int X^2 \sin X dx$
 $\underbrace{\hspace{2em}}_{\text{"PARTS"}}$
 $yX^3 =$



$yX^3 = -X^2 \cos X + 2X \sin X + 2 \cos X + C$

$\frac{yX^3}{X^3} = \frac{-X^2 \cos X}{X^3} + \frac{2X \sin X}{X^3} + \frac{2 \cos X}{X^3} + \frac{C}{X^3}$

$y = \frac{-\cos X}{X} + \frac{2 \sin X}{X^2} + \frac{2 \cos X}{X^3} + \frac{C}{X^3}$