

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

1.  $y' + \underbrace{5y}_{P(x)} = x + e^{-3x}$

② I.F.  
 $\mu(x) = e^{\int 5 dx}$

③  $e^{5x}(y' + 5y) = e^{5x}(x + e^{-3x})$

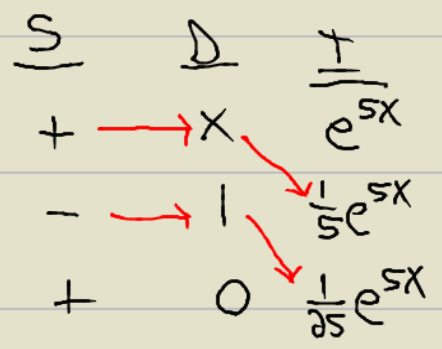
$\mu(x) = e^{5x}$

$\underbrace{e^{5x}}_Q y' + \underbrace{5e^{5x}}_{Q'} \underbrace{y}_P = x e^{5x} + e^{2x}$

$\int e^{5x} dx$   
 $u = 5x \quad du = 5 dx$

④  $\frac{d}{dx} [y e^{5x}] = x e^{5x} + e^{2x}$

⑤  $\int \frac{d}{dx} [y e^{5x}] dx = \int (x e^{5x} + e^{2x}) dx$



$y e^{5x} = \int (x e^{5x}) dx + \int e^{2x} dx$   
 "PARTS"                      "u-sub"

$y e^{5x} = \frac{1}{5} x e^{5x} - \frac{1}{25} e^{5x} + \frac{1}{2} e^{2x} + C$

$\frac{\cancel{y e^{5x}}}{\cancel{e^{5x}}} = \frac{1}{5} \cdot \frac{x \cancel{e^{5x}}}{\cancel{e^{5x}}} - \frac{1}{25} \cdot \frac{\cancel{e^{5x}}}{\cancel{e^{5x}}} + \frac{1}{2} \cdot \frac{e^{2x}}{e^{5x}} + \frac{C}{e^{5x}}$

$y = \frac{x}{5} - \frac{1}{25} + \frac{1}{2} e^{-3x} + \frac{C}{e^{5x}}$

$y = \frac{1}{5}x - \frac{1}{25} + \frac{1}{2}e^{-3x} + ce^{-5x}$