

$$I = \int_1^e \frac{dt}{t(1+t^2)} \quad \text{:- حساب 1}$$

$$t = \frac{1}{U} \quad \text{:- نضع} \quad U = \frac{1}{t} \quad \text{أي}$$

$$dt = -\frac{1}{U^2} dU \quad \text{ومنه}$$

$$U = \frac{1}{1} = 1 \quad \text{:- لدينا} \quad t = 1 \quad \text{من أجل}$$

$$U = \frac{1}{e} \quad \text{:- لدينا} \quad t = e \quad \text{ومن أجل}$$

$$I = \int_1^e \frac{-\frac{1}{U^2} dU}{\frac{1}{U} \left(1 + \frac{1}{U^2}\right)} = - \int_1^e \frac{U}{U^2 + 1} dU \quad \text{إذن}$$

$$= \int_{\frac{1}{e}}^1 \frac{U}{U^2 + 1} dU = \frac{1}{2} \int_{\frac{1}{e}}^1 \frac{(U^2 + 1)'}{U^2 + 1} dU$$

$$= \frac{1}{2} [\ln(U^2 + 1)]_{\frac{1}{e}}^1 = \frac{1}{2} \left(\ln 2 - \ln \left(\frac{1}{e^2} + 1 \right) \right)$$

$$= \frac{1}{2} \left[\ln 2 - \ln \left(\frac{e^2 + 1}{e^2} \right) \right] = \frac{1}{2} [\ln 2 - \ln(e^2 + 1) + \ln e^2]$$

$$= \frac{1}{2} (\ln 2 - \ln(e^2 + 1) + 2)$$

$$I = 1 + \frac{1}{2} \ln 2 - \frac{1}{2} \ln(e^2 + 1) \quad \text{وبالتالي فإن}$$

$$J = \int_1^e \frac{2t \ln t}{(1+t^2)^2} dt \quad \text{:- حساب 2}$$

$$V' = \frac{2t}{(1+t^2)^2} = \frac{(1+t^2)'}{(1+t^2)^2} \quad \text{و} \quad U = \ln t \quad \text{نضع}$$

$$V = \frac{-1}{1+t^2} \quad U' = \frac{1}{t}$$

$$J = [UV]_1^e - \int_1^e U' V dt \quad \text{إذن}$$

$$\begin{aligned} &= \left[\frac{-\ln t}{1+t^2} \right]_1^e + \int_1^e \frac{1}{t(1+t^2)} dt \\ &= \frac{-1}{1+e^2} + I = \frac{-1}{1+e^2} + 1 + \frac{1}{2} \ln 2 - \frac{1}{2} \ln (e^2 + 1) \\ J &= \frac{e^2}{e^2 + 1} + \frac{1}{2} \ln 2 - \frac{1}{2} \ln (e^2 + 1) \quad \text{وبالتالي فإن :} \end{aligned}$$

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