

$$\int_0^1 \int_0^1 \tan^{-1} x \cdot y \, dy \, dx$$

$$= \int_0^1 \left\{ y \int_0^1 \tan^{-1} x \, dx \right\} dy$$

$$= \int_0^1 y \left\{ \int_0^1 1 \cdot \tan^{-1} x \, dx \right\} dy$$

$$= \int_0^1 y \cdot \left[\tan^{-1} x \cdot 1 - dx - \left(\frac{d(\tan^{-1} x)}{dx} \cdot 1 \cdot dx \right) \right] dy$$

$$= \int_0^1 y \left[x \tan^{-1} x - \int \frac{x}{1+x^2} dx \right] dy$$

$$= \int_0^1 y \left[x \tan^{-1} x - \frac{1}{2} \ln(x^2+1) \right] dy$$

$$= \int_0^1 y \left[1 \cdot \tan^{-1}(1) - \frac{1}{2} \ln 2 - 0 + 0 \right] dy$$

$$= \int_0^1 y \left(\frac{\pi}{4} - \frac{1}{2} \ln 2 \right) dy$$

$$= \left(\frac{\pi}{4} - \frac{1}{2} \ln 2 \right) \int_0^1 y \, dy$$

$$= \frac{1}{2} \left(\frac{\pi}{4} - \frac{1}{2} \ln 2 \right)$$

$$= 0.5 (0.78539 - 0.34657)$$

$$= 0.21941$$