Problem 4. Show that :

$$\int_{\mathbb{R}^n} f(x)dx = \pi^n$$

where

$$f(x) = \prod_{k=1}^{n} f_k(x)$$

with

$$f_k(x) = \frac{1}{1 + x_k^2}$$

and

$$dx = \prod_{k=1}^{n} dx_k$$