Calcolare il seguente integrale :

$$\int_0^{\pi} \frac{2}{\pi^2 + x^2} dx =$$

Svolgimento:

$$\int_0^{\pi} \frac{2}{\pi^2 + x^2} dx = 2\int_0^{\pi} \frac{\frac{1}{\pi^2}}{1+\left(\frac{x}{\pi}\right)^2} dx = \frac{2}{\pi}\int_0^{\pi} \frac{\frac{1}{\pi}}{1+\left(\frac{x}{\pi}\right)^2} dx = \left[\frac{2}{\pi}\operatorname{arctg}\left(\frac{x}{\pi}\right)\right]_0^{\pi} = \frac{2}{\pi}\left(\frac{\pi}{4}\right) = \frac{1}{2}$$

Calcolare il seguente integrale :

$$\int_1^{2} x\ln(x)dx =$$

Svolgimento:

procediamo per parti $\int f(x)\cdot g'(x)dx = f(x)g(x) - \int f'(x)\cdot g(x)dx =$,

indicando $x = g'(x)$, $\ln(x) = f(x)$

$$\int_1^{2} x\ln(x)dx = \left[\frac{x^2}{2}\ln(x) - \int \frac{x^2}{2}\cdot\frac{1}{x}dx\right]_1^2 = \left[\frac{x^2}{2}\ln(x) - \frac{x^2}{4}\right]_1^2 = 2\ln 2 - 1 + \frac{1}{4} = \ln(4) - \frac{3}{4}$$