

Auxiliar 7

Profesor: Juvenal Letelier

Auxiliar: Edgardo Rosas

P1. Calcule

$$J(a) = \int_0^{\infty} \frac{x^2}{(a^2 + x^2)^2} dx, \quad a > 0. \quad (1)$$

Demuestre usando la parte anterior que se cumple

$$\int_0^{\infty} \frac{x^2}{(a^2 + x^2)^3} dx = \frac{\pi}{8a^3}. \quad (2)$$

P2. Sea $\Gamma = \{z \in \mathbb{C}, |z| = 2\}$. Calcule la integral

$$\oint_{\Gamma} \frac{dz}{z^2(z-3)}. \quad (3)$$

P3. Demuestre que

$$\int_0^{\infty} \frac{dx}{(1+x^2)^2} = \frac{\pi}{4} \quad (4)$$

P4. Calcule

$$I = \int_{\mathbb{R}^3} \frac{\exp(i \mathbf{r} \cdot \mathbf{p})}{\|\mathbf{p}\|^2 + m^2} d^3 p \quad (5)$$