

Solución General del Potencial - Separacion de Variables

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1 Coordenadas Cartesianas

1.1 Base en x, y

Espacio acotado

$$\Phi(x, y, z) = \sum_{n=1}^{\infty} \sum_{m=1}^{\infty} \sin\left(\frac{n\pi x}{a}\right) \sin\left(\frac{m\pi y}{b}\right) \left[A_{nm} e^{+\kappa_{nm} z} + B_{nm} e^{-\kappa_{nm} z} \right], \quad \kappa_{nm} = \sqrt{\left(\frac{n\pi}{a}\right)^2 + \left(\frac{m\pi}{b}\right)^2}. \quad (1)$$

Espacio no acotado

$$\Phi(x, y, z) = \iint_{-\infty}^{\infty} e^{i(k_x x + k_y y)} \left[A(k_x, k_y) e^{+\kappa z} + B(k_x, k_y) e^{-\kappa z} \right] \frac{dk_x dk_y}{(2\pi)^2}, \quad \kappa = \sqrt{k_x^2 + k_y^2}. \quad (2)$$

1.2 Base en x, z

Espacio acotado

$$\Phi(x, y, z) = \sum_{n=1}^{\infty} \sum_{p=1}^{\infty} \sin\left(\frac{n\pi x}{a}\right) \sin\left(\frac{p\pi z}{c}\right) \left[C_{np} e^{+\kappa'_{np} y} + D_{np} e^{-\kappa'_{np} y} \right], \quad \kappa'_{np} = \sqrt{\left(\frac{n\pi}{a}\right)^2 + \left(\frac{p\pi}{c}\right)^2}. \quad (3)$$

Espacio no acotado

$$\Phi(x, y, z) = \iint_{-\infty}^{\infty} e^{i(k_x x + k_z z)} \left[C(k_x, k_z) e^{+\kappa' y} + D(k_x, k_z) e^{-\kappa' y} \right] \frac{dk_x dk_z}{(2\pi)^2}, \quad \kappa' = \sqrt{k_x^2 + k_z^2}. \quad (4)$$

1.3 Base en y, z

Espacio acotado

$$\Phi(x, y, z) = \sum_{m=1}^{\infty} \sum_{p=1}^{\infty} \sin\left(\frac{m\pi y}{b}\right) \sin\left(\frac{p\pi z}{c}\right) \left[E_{mp} e^{+\kappa''_{mp}x} + F_{mp} e^{-\kappa''_{mp}x} \right], \quad \kappa''_{mp} = \sqrt{\left(\frac{m\pi}{b}\right)^2 + \left(\frac{p\pi}{c}\right)^2}. \quad (5)$$

Espacio no acotado

$$\Phi(x, y, z) = \iint_{-\infty}^{\infty} e^{i(k_y y + k_z z)} \left[E(k_y, k_z) e^{+\kappa''x} + F(k_y, k_z) e^{-\kappa''x} \right] \frac{dk_y dk_z}{(2\pi)^2}, \quad \kappa'' = \sqrt{k_y^2 + k_z^2}. \quad (6)$$