

5. General Methods for Laplace's Equation
Self-test questions

1. A long rectangular cavity with

$$\begin{aligned} -L/2 \leq z \leq L/2, \\ 0 \leq x \leq a, \\ 0 \leq y \leq b, \end{aligned}$$

(with $a \ll L$ and $b \ll L$) is grounded on the four long sides and held at potential V_0 on the ends at $z = \pm L/2$. Find the potential $V(x, y, z)$.

2. Discuss the potential function of a neutral conducting sphere in an applied field $\mathbf{E}_0 = E_0 \hat{\mathbf{k}}$, in terms of separation of variables for spherical polar coordinates.

3. Consider the analytic function $F(z) = C + z^2$ where C is a constant.
(a) If $\text{Re } F(z)$ is taken to be the potential, what are the boundary conditions? (b) If $\text{Im } F(z)$ is taken to be the potential, what are the boundary conditions?