
4321 and 7305

1. Consider a rectangular channel of size $a \times b$ and infinite in the third dimension. One of the faces of length a is maintained at voltage V_0 (constant) while the other three faces are grounded.
 - (a) Find the solution $\Phi(x, y)$ inside the channel that satisfies Laplace's equation and matches the boundary conditions. Simplify your answer as much as possible.
 - (b) Plot $\Phi(x, y)$ as a function of x and y .
 - (c) If $a = 5$ meters, $b = 3$ meters, and $V_0 = 4$ volts, what is the value of the electrostatic potential at $x = 2$ meters, $y = 1$ meter, and $z =$ eleventy billion meters?