PHYS 703 - Parallel Plate capacitor.

1. It is a curious but underappreciated fact that every term in the sum

$$\sum_{k=1}^{\infty} \frac{\sin(2k-1)x}{2k-1}$$

depends on x (where $0 < x < \pi$), but the sum, which equals $\pi/4$, does not!

Consider an empty parallel plate capacitor. Faces $y = 0$, $y = b$, $z = 0$, $z = c$ are all held at zero potential. The plate at $x = 0$ is held at $V_1 = 10\text{V}$, while the plate at $x = a$ is held at $V_2 = 15\text{V}$.

(a) Write down the solution for the potential everywhere in the capacitor.

(b) Show that the potential inside the capacitor in the limit that a is very small compared to b and c, becomes what you naively expect. Determine the electric field components at the center of the capacitor in this case.