## Warmup 1 - Delta functions

You have a volume charge density given by  $\rho(x, y, z) = a\delta(x-1)\delta(z)$  (where **a** is a constant, and  $\delta$  refers to the usual Dirac-delta function). What are the dimensions of the constant **a**?

Describe in words, briefly but clearly, what physical situation this volume charge density represents.

Write a formula for the volume charge density of an electric charge +q located at position  $R_0 = (x_0, y_0, z_0)$  using Cartesian coordinates,

 $\rho(x, y, z) =$ 

Suppose you have a uniform surface charge density confined to the x-y plane (think of an infinitely ultra-thin flat *sheet* of charge at z = 0). Consider the electric field at point x, y, z. By symmetry arguments ONLY (no Gauss' law calculation here!) what direction could it point? Please choose ALL that apply:

- a) +x-hate) -y-hatb) +y-hatf) -z-hatc) +z-hatg) None of the above
- d) -x-hat

By symmetry arguments ONLY, what variable(s) (x, y, and/or z) could the E field depend on? Please choose ALL that apply:

a) xb) yc) zd) None of the above

Please explain your answer: