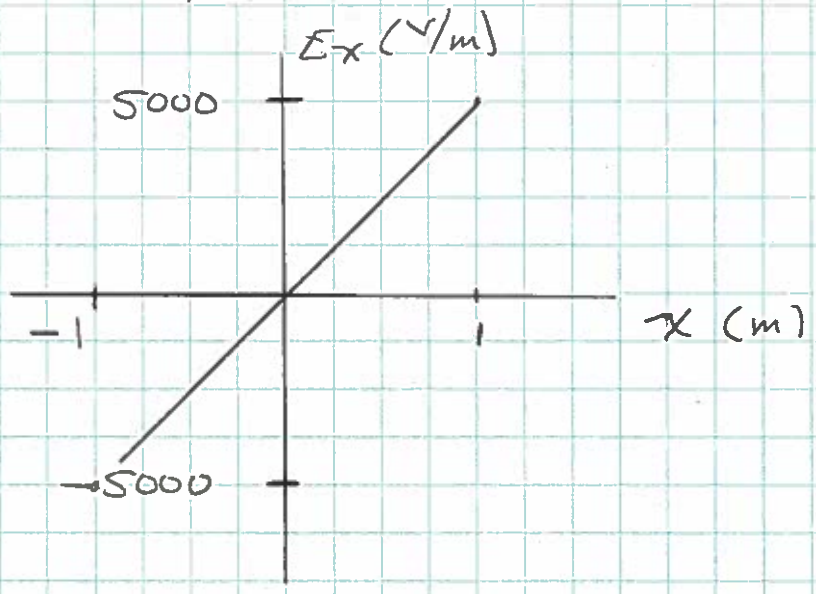
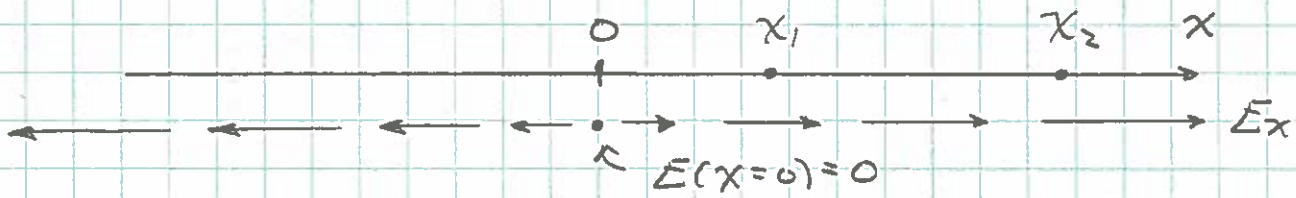
$E_x = 5000x \frac{V}{m}$ (Nonuniform)

a.)



What does this field look like?

$E_x = 5000x \frac{V}{m}$ & $E_y = 0$



b.) Between any two points x_1 & x_2.

$$\Delta V = V_2 - V_1 = -\int_1^2 \vec{E} \cdot d\vec{s}$$

$\vec{E} = 5000x\,\hat{i}\ \frac{V}{m}$ $\quad d\vec{s} = \hat{i}\,dx$ $\quad \vec{E} \cdot d\vec{s} = 5000x\,dx$

$$\Delta V = -\int_{x_1}^{x_2} 5000x\,dx = -5000\left(\frac{x^2}{2}\right)\Big|_{x_1}^{x_2}$$

So $\Delta V = V_2 - V_1 = -2500\left(x_2^2 - x_1^2\right)$

And $x_1 = 0$ and $x_2 = x$ and $V(0) = 0$;

$$V = -2500x^2$$

c.)