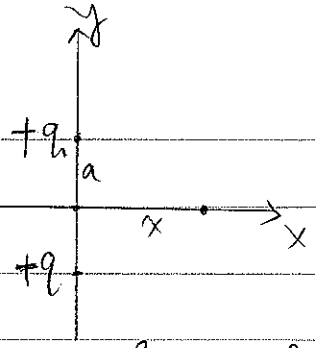
Solution HW #6.

23.22

(a)

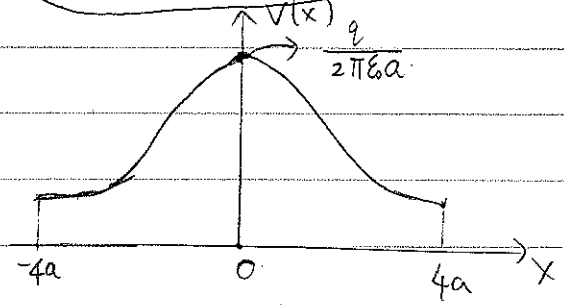


(b) $V_0 = \frac{1}{4\pi\varepsilon_0}\frac{2q}{a}$

(c) $V(x) = \frac{1}{4\pi\varepsilon_0}\left(\frac{q}{\sqrt{a^2+x^2}} + \frac{q}{\sqrt{a^2+x^2}}\right)$

$= \frac{1}{4\pi\varepsilon_0}\frac{2q}{\sqrt{a^2+x^2}}$

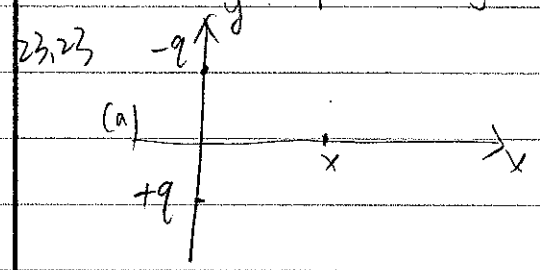
(d)



(e) $V(x) = \frac{1}{2\pi\varepsilon_0}\frac{q/x}{\sqrt{1+(\frac{a}{x})^2}}$ $x \gg a$ $\frac{a}{x} \approx 0$

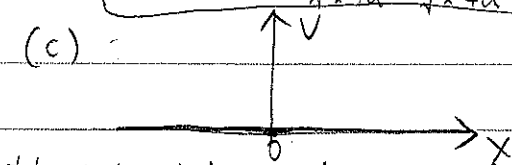
$V(x) = \frac{1}{2\pi\varepsilon_0}\cdot\frac{q}{x} = \frac{q}{2\pi\varepsilon_0 x}$. The two charges can be considered as a point charge with $2q$ at a distance far away from it.

23.23



(b) $V(x) = \frac{1}{4\pi\varepsilon_0}\left[\frac{q}{\sqrt{x^2+a^2}} + \frac{-q}{\sqrt{x^2+a^2}}\right] = 0$

(c)



the potential on the X-axis is 0

(d) $V(x) = 0$