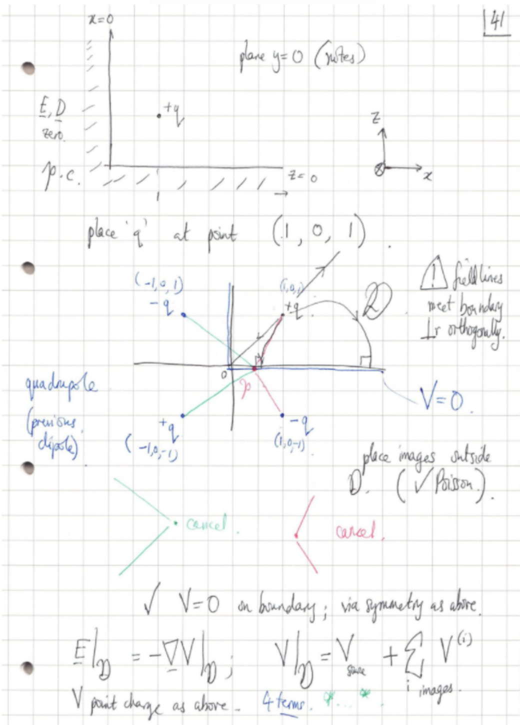

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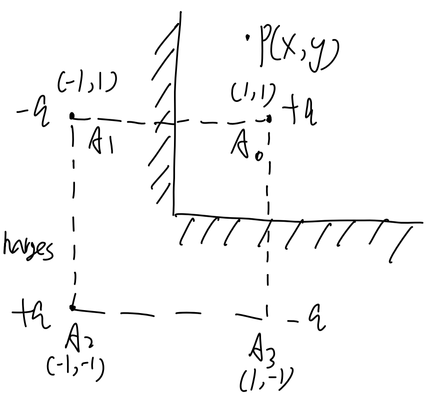

P(x,y) is in the first quadrant

$A_0(1,1)$ is the point charge

$A_1(-1,1)$, $A_2(-1,-1)$, $A_3(1,-1)$ are the image charges

$$\therefore V = \frac{q}{4\pi\varepsilon_0} \cdot \frac{1}{|\bar{r}|}$$

$$\because V_p = V_{p_0} + V_{p_1} + V_{p_2} + V_{p_3}$$

$$V_{p_0} = \frac{q}{4\pi\varepsilon_0} \cdot \frac{1}{\sqrt{(x-1)^2+(y-1)^2}} \qquad V_{p_1} = \frac{-q}{4\pi\varepsilon_0} \cdot \frac{1}{\sqrt{(x+1)^2+(y-1)^2}}$$

$$V_{p_2} = \frac{q}{4\pi\varepsilon_0} \cdot \frac{1}{\sqrt{(x+1)^2+(y+1)^2}} \qquad V_{p_3} = \frac{-q}{4\pi\varepsilon_0} \cdot \frac{1}{\sqrt{(x-1)^2+(y+1)^2}}$$

$$\therefore V_p = \frac{q}{4\pi\varepsilon_0}\left[\frac{1}{\sqrt{(x-1)^2+(y-1)^2}} - \frac{1}{\sqrt{(x+1)^2+(y-1)^2}} + \frac{1}{\sqrt{(x+1)^2+(y+1)^2}} - \frac{1}{\sqrt{(x-1)^2+(y+1)^2}}\right]$$

$\because \overline{E}_p = -\nabla \cdot V$

$$= \frac{q}{4\pi\varepsilon_0}\left[-\frac{x-1}{((x-1)^2+(y-1)^2)^{\frac{3}{2}}} + \frac{x+1}{((x+1)^2+(y-1)^2)^{\frac{3}{2}}} - \frac{x-1}{((x+1)^2+(y+1)^2)^{\frac{3}{2}}} + \frac{x-1}{((x-1)^2+(y+1)^2)^{\frac{3}{2}}}\right]\overline{a_x} + \frac{q}{4\pi\varepsilon_0}\left[-\frac{y-1}{((x-1)^2+(y-1)^2)^{\frac{3}{2}}} + \frac{y-1}{((x+1)^2+(y-1)^2)^{\frac{3}{2}}} - \frac{y+1}{((x+1)^2+(y+1)^2)^{\frac{3}{2}}} + \frac{y+1}{((x-1)^2+(y+1)^2)^{\frac{3}{2}}}\right]\overline{a_y}$$

$(x \geq 0 \ \& \ y \geq 0)$