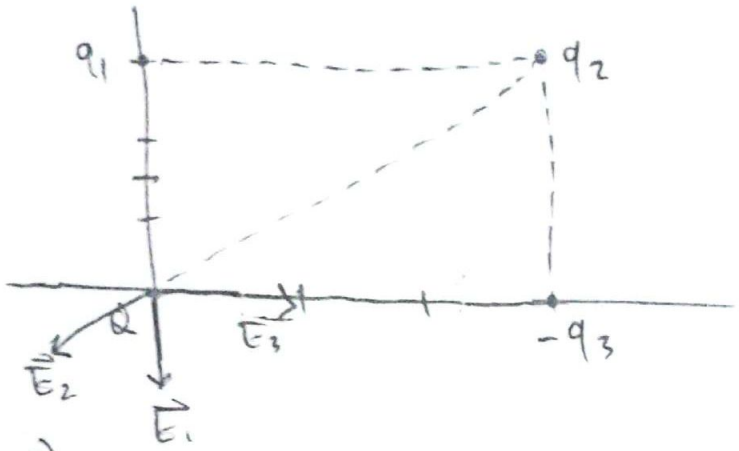
$$W = 0 + \left(k\frac{q_1 q_2}{a}\right) + \left(k\frac{q_1 q_3}{a\sqrt{2}} + k\frac{q_2 q_3}{a}\right) + \left(k\frac{q_1 q_4}{a} + k\frac{q_2 q_4}{a\sqrt{2}} + k\frac{q_3 q_4}{a}\right)$$



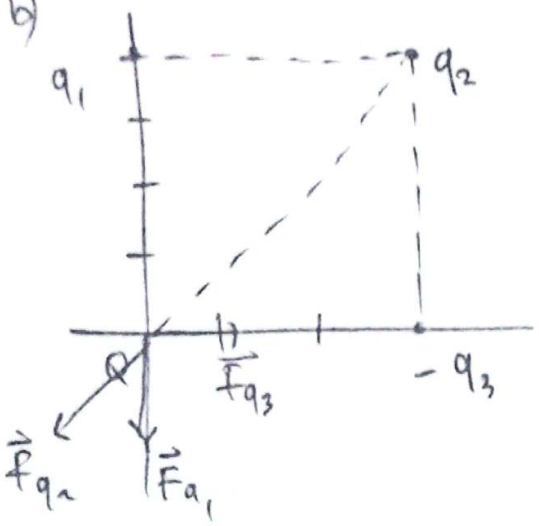
a) $$E_P = \left[k\left(\frac{q_1}{4^2}(-\hat{j}) + \frac{q_2}{5^2}\left(\frac{-4\hat{j} - 3\hat{i}}{5}\right) + \frac{q_3}{3^2}(-\hat{i})\right)\right]$$

$$= k\left[-\hat{i}\left(\frac{q_3}{3^2}\right) + \left(\frac{q_2}{5^2}\frac{4}{5}\right) + \left(-\hat{j}\left(\frac{q_1}{4^2}\right) - \left(\frac{q_2}{5^2}\frac{3}{5}\right)\right)\right.$$

$$= k\left[-\hat{i}\left(\frac{q_3}{3^2}\right) + \left(\frac{q_2}{5^2}\frac{4}{5}\right) - \hat{j}\left(\frac{q_1}{4^2}\right) - \left(\frac{q_2}{5^2}\frac{3}{5}\right)\right.$$

c) $$V_Q = k\left[\frac{q_1}{4} + \frac{q_2}{5} - \frac{q_3}{3}\right]$$

b)

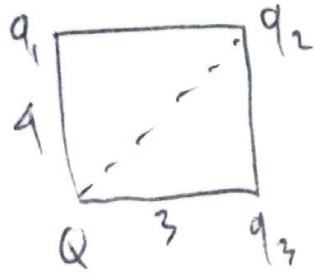


$$F_Q = kQ\left[\frac{q_1}{4^2}(-\hat{j}) + \frac{q_2}{5^2}\frac{(-3\hat{i}-4\hat{j})}{5} + \frac{q_3}{3^2}(\hat{i})\right]$$

$$= kQ\left[\hat{i}\frac{q_3}{3^2}\left(\frac{4^2}{5^2}\frac{3}{5}\right) - \hat{j}\left(\frac{q_1}{4^2}\left(\frac{q_2}{5^2}\frac{4}{5}\right)\right)\right]$$

$$= kQ\left[\hat{i}\left(\frac{q_3}{3^2}\right) - \left(\frac{q_2}{5^2}\frac{3}{5}\right) - \hat{j}\left(\frac{q_1}{4^2}\right) - \left(\frac{q_2}{5^2}\frac{4}{5}\right)\right]$$

d)



$$W_{total} = V_1 Q + V_2 Q + V_3 Q$$

$$= k\frac{q_1 Q}{4} + k\frac{q_2 Q}{5} + k\frac{q_3 Q}{3}$$