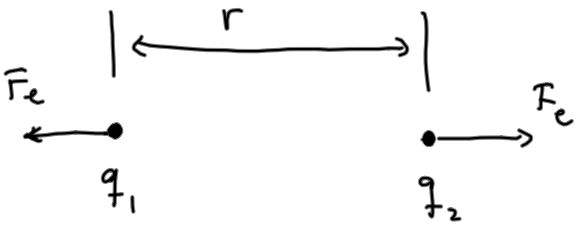
Kapittel 22:
Elektrisk felt

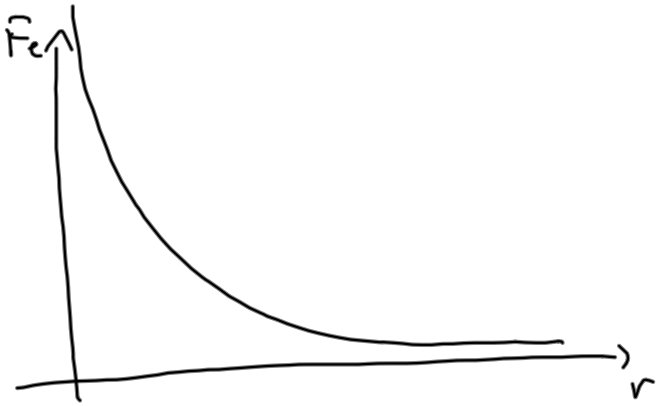
Coulombs lov

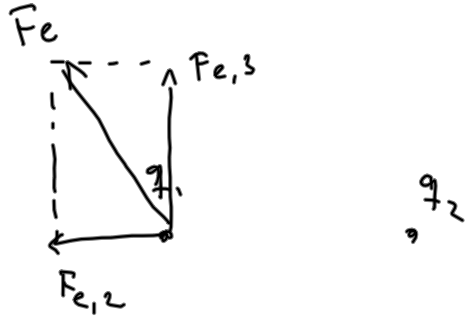


$$F_e = k_e \frac{q_1 q_2}{r^2} \qquad k_e = 8{,}99 \cdot 10^9 \frac{N m^2}{C^2}$$

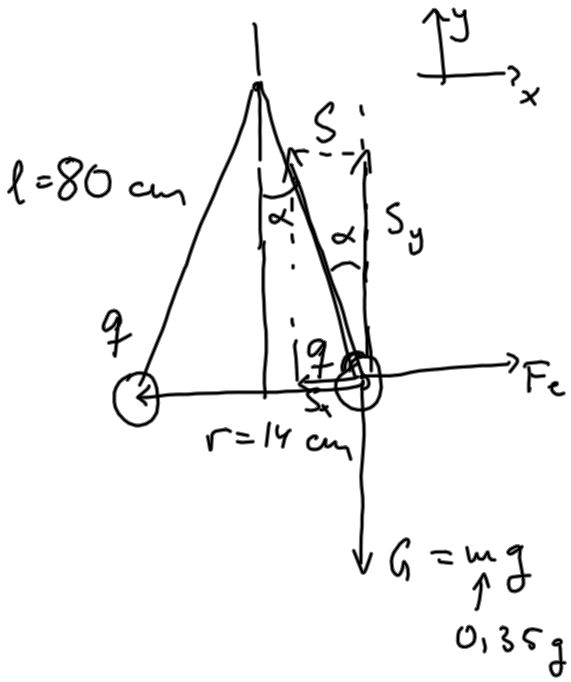
Eks $\quad q_1 = q_2 = 1\,C \qquad r = 1\,m$

$$F_e = k_e \cdot \frac{1 \cdot C \; 1C}{(1m)^2} = 8{,}99 \cdot 10^9 \, N$$





Hvor stor ladning får vi når vi gnir på en ballong?



$$\sum F_x = F_e - S_x = 0 \qquad F_e = S_x = S \sin\alpha$$

$$\sum F_y = S_y - G = 0 \qquad S_y = S\cos\alpha = G = mg$$

$$S = \frac{mg}{\cos\alpha}$$

$$F_e = \frac{mg}{\cos\alpha}\sin\alpha$$

$$= mg\tan\alpha = 0{,}35\cdot 10^{-3}\,kg \cdot 9{,}81\,m/s^2 \cdot \tan 5^\circ$$

$$= 3\cdot 10^{-4}\,N$$

$$\frac{r/2}{l} = \sin\alpha \qquad \alpha = \sin^{-1}\frac{7\,cm}{80\,cm} = 5{,}02^\circ \approx 5^\circ$$

$$F_e = k_e\frac{q_1 q_2}{r^2} = k_e\frac{q^2}{r^2}$$

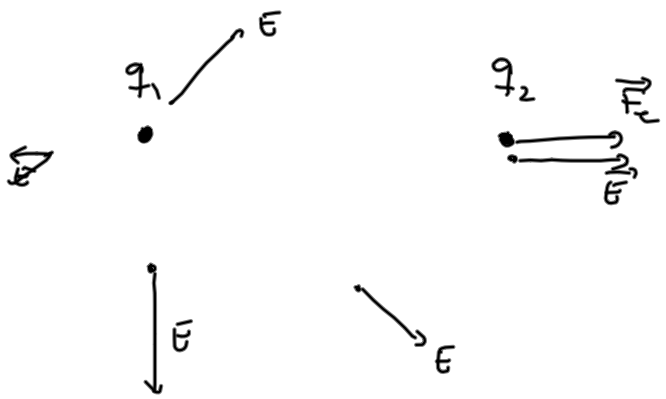
$$q = \sqrt{\frac{F_e r^2}{k_e}} = (8{,}2\cdot 10^{-9}\,C)?$$

$$2{,}6\cdot 10^{-8}\,C$$

$$e = 1{,}6\cdot 10^{-19}\,C$$

$$N = \frac{q}{e} \approx 4\cdot 10^{10}\ \text{elektroner}$$

Elektrisk felt



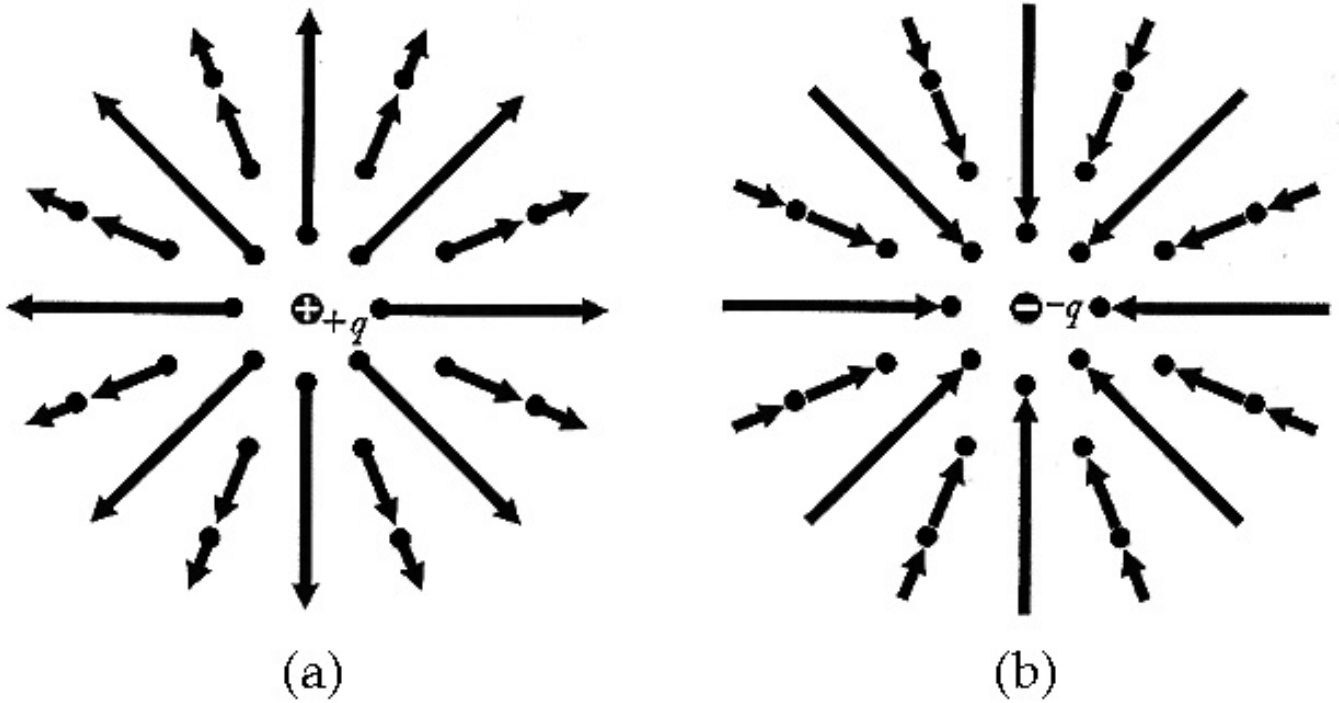
$$\vec{E} = \frac{\vec{F}_e}{q_2}$$

$$F_e = k_e \frac{q_1 q_2}{r^2}$$

$$E = |\vec{E}| = k_e \frac{q_1}{r^2}$$

Felt fra punktladninger

$E = k \frac{q}{r^2}$

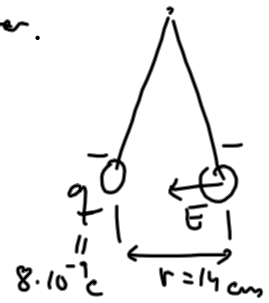


(a) (b)

Figure 6

Eksempler

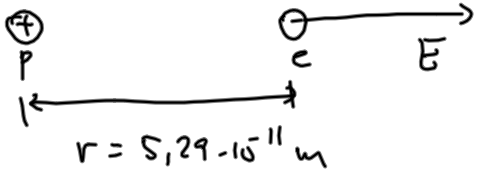
a) Ballonger.



$$E = k_e \frac{q}{r^2} = 8{,}99 \cdot 10^9 \frac{Nm^2}{c^2} \frac{8{,}7\,10^{-7}\,c}{(0{,}14\,m)^2} \simeq 10^4 \frac{N}{c}$$

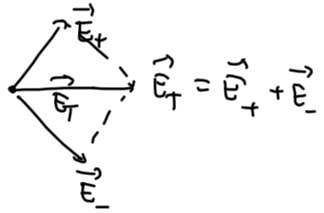
b) H-atom

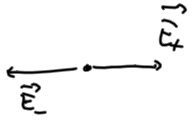
$e = 1{,}6 \cdot 10^{-19}$ c



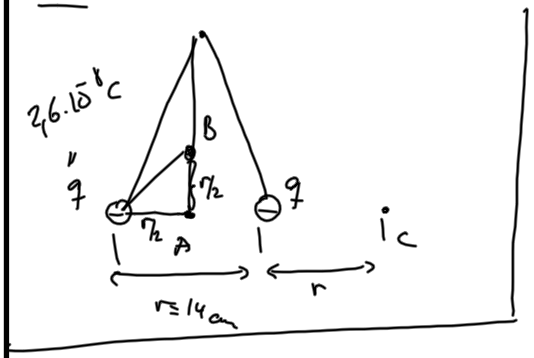
$$E = k_e \frac{e}{r^2} = 5{,}4 \cdot 10^{11}\ N/c$$

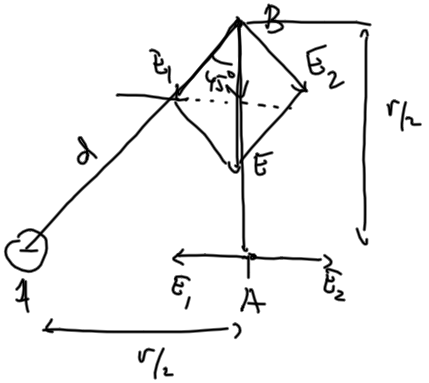
Elektrisk dipol, superposisjonsprisippet for felt.

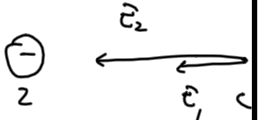




Eks







A: $E = 0$

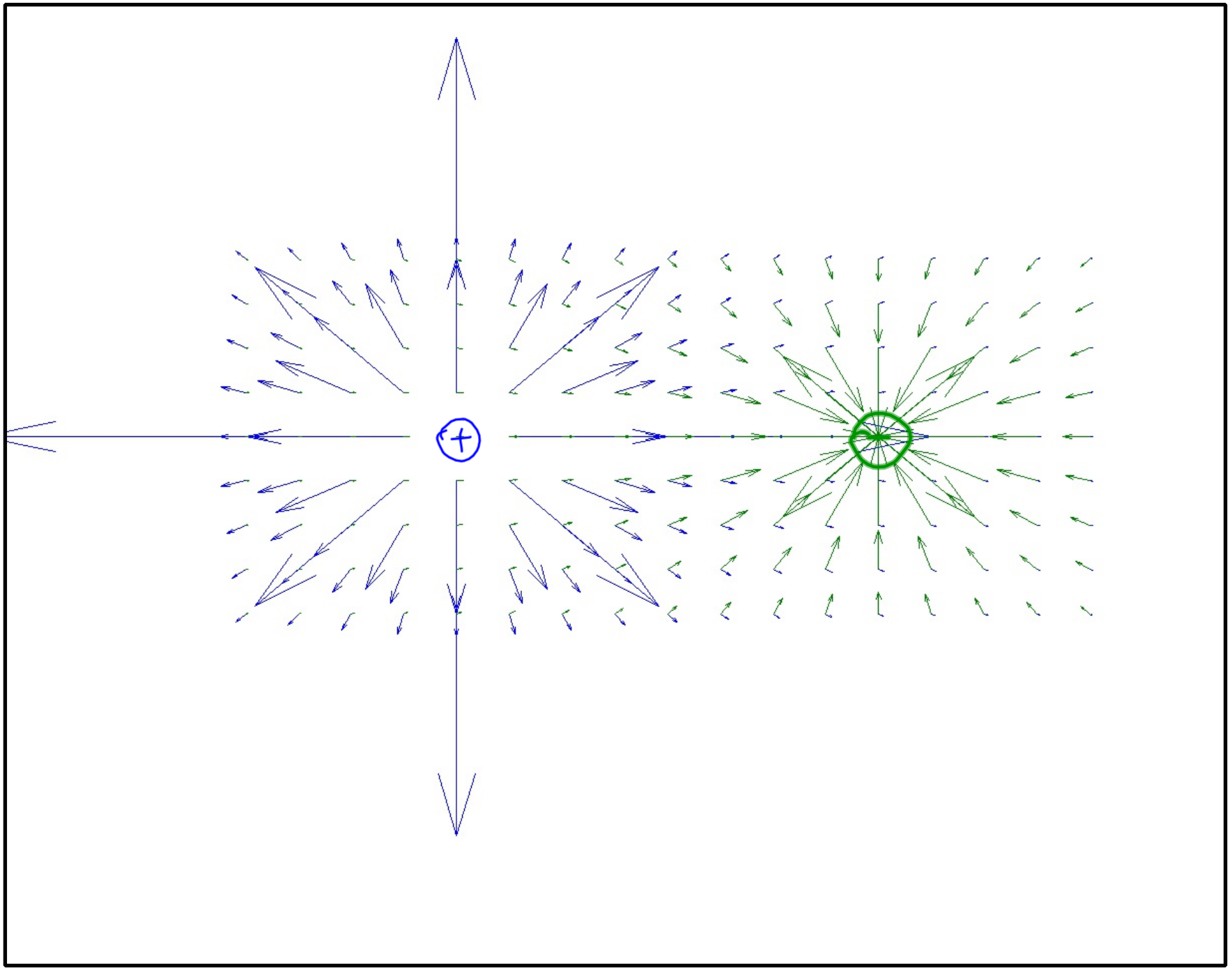
C: $E = k_e \frac{q}{(2r)^2} + k_e \frac{q}{r^2} =$

B, $d^2 = \left(\frac{r}{2}\right)^2 + \left(\frac{r}{2}\right)^2 = \frac{1}{2} r^2$

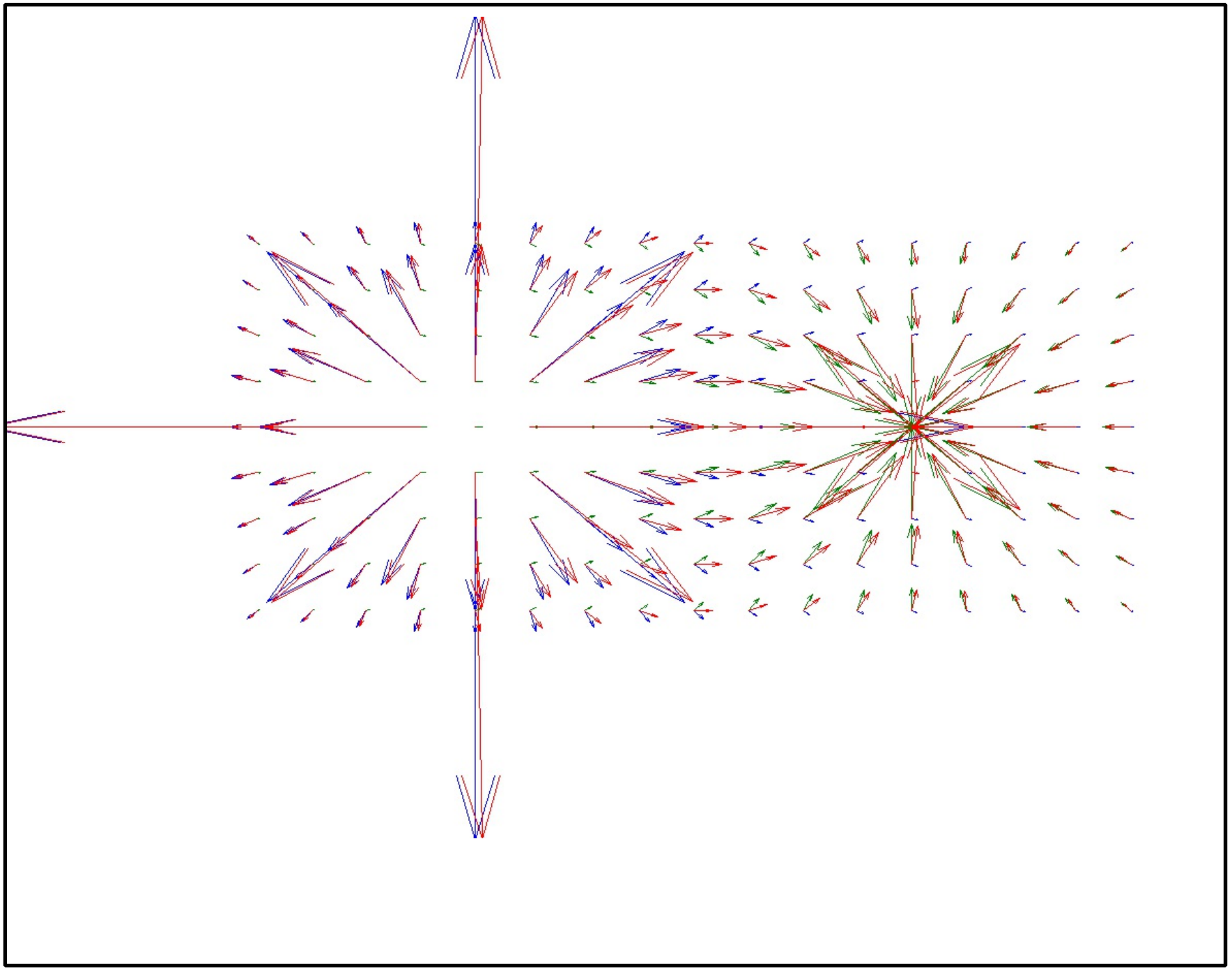
$E_1 = k_e \frac{q}{d^2} = k_e \frac{q}{\frac{1}{2} r^2} 2 =$

$E_2 = E_1$

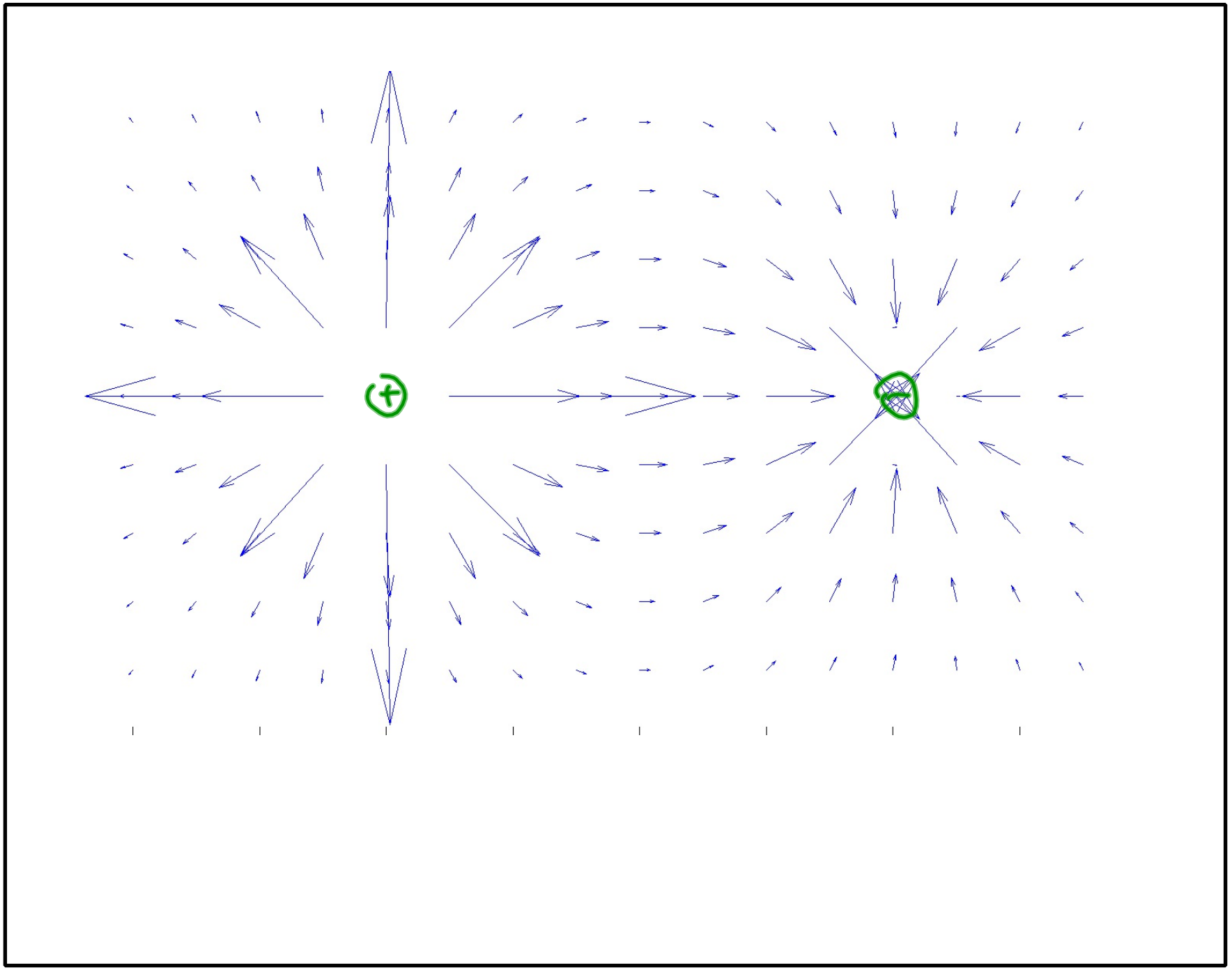
$E = E_1 \cos 45^\circ + E_2 \cos 45^\circ =$



Title : Apr 29-11:00 AM (Page 8 of 17)



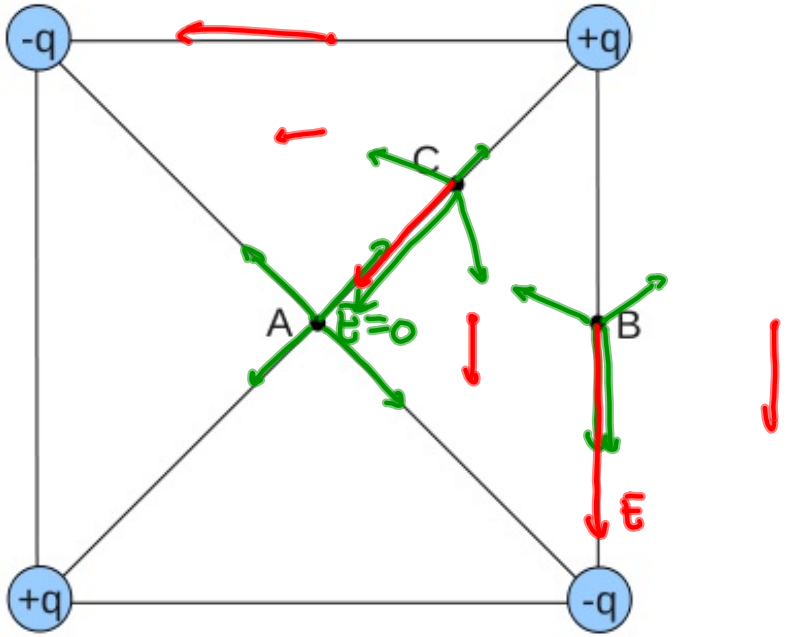
Title : Apr 29-11:00 AM (Page 9 of 17)



Title : Apr 29-11:07 AM (Page 10 of 17)

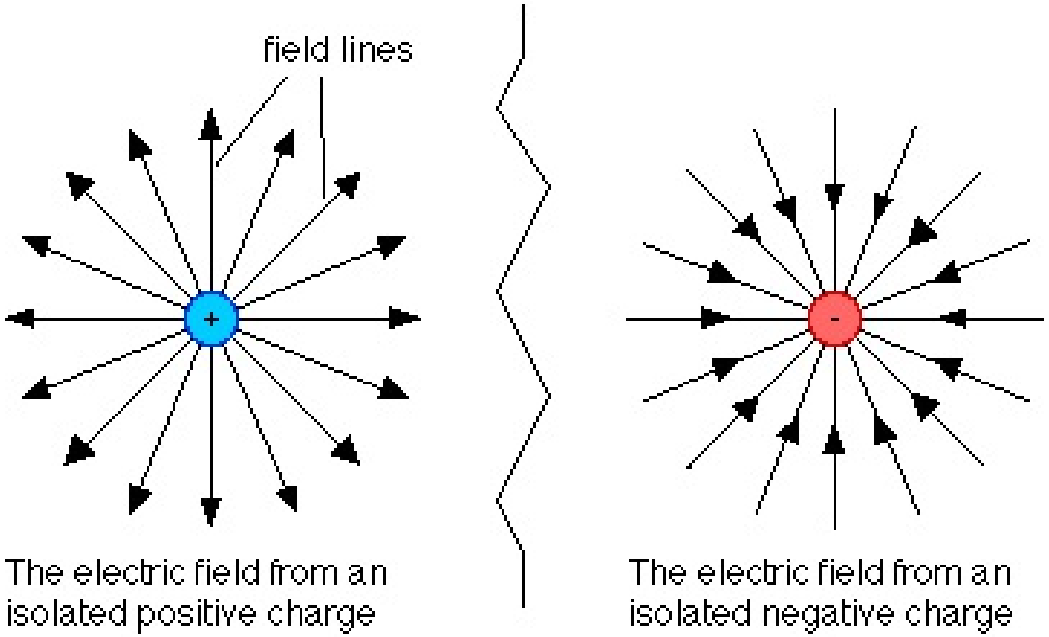
Samsnakk

Fire like store ladninger, to positive og to negative er plassert i hjørnene på et kvadrat som vist på figuren



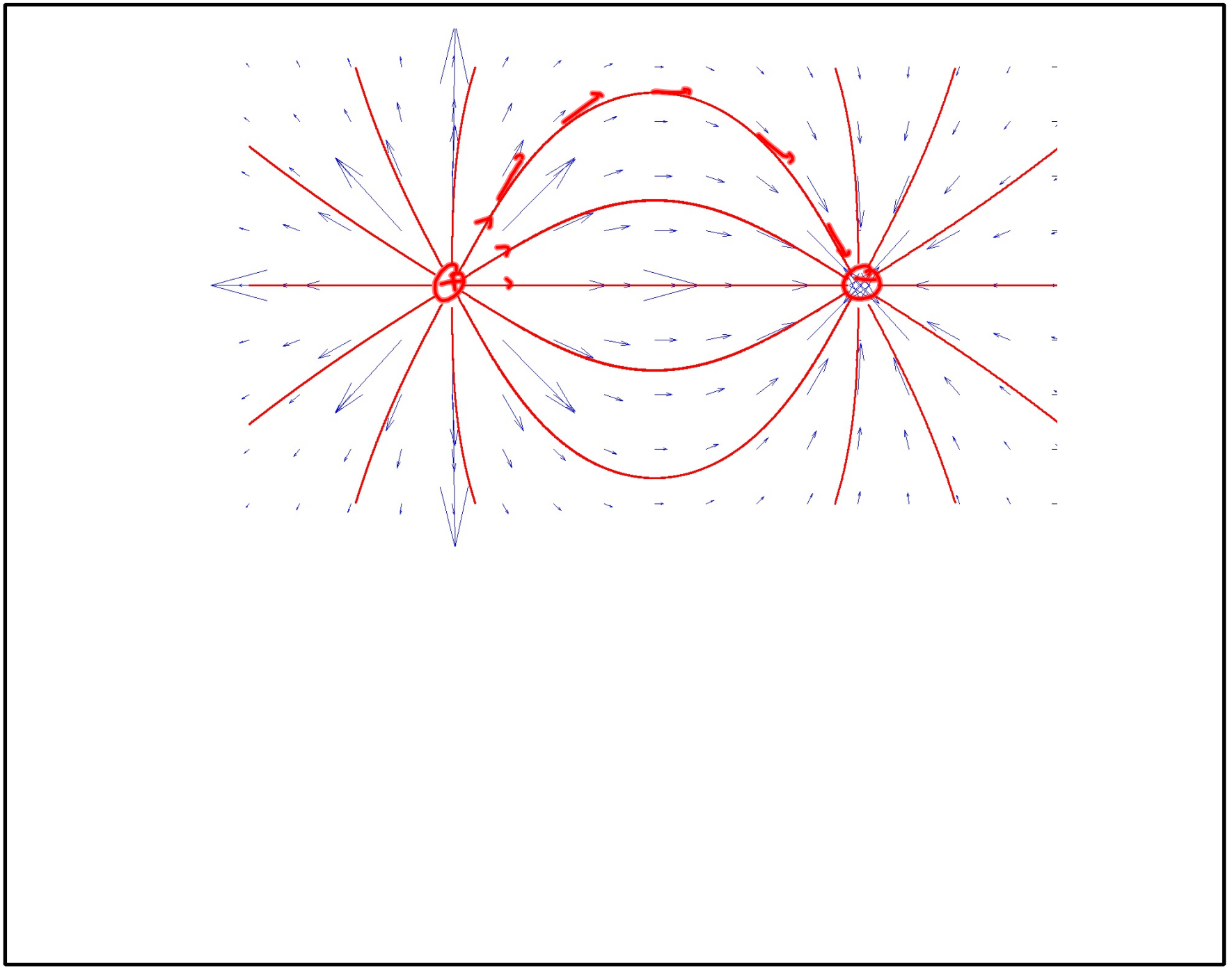
Tegn det elektriske feltet i punktene A, B og C.

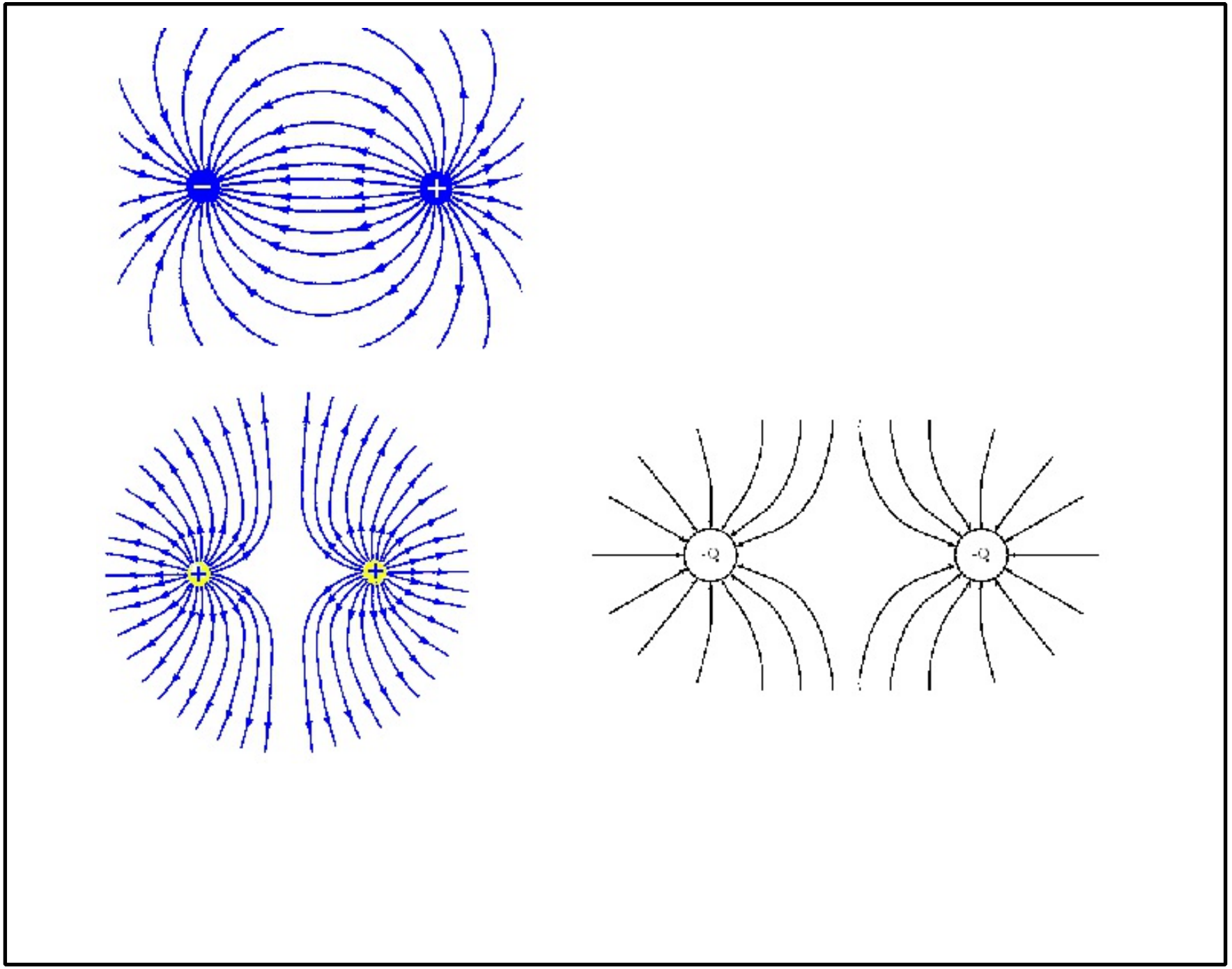
Elektriske feltlinjer



The electric field from an isolated positive charge

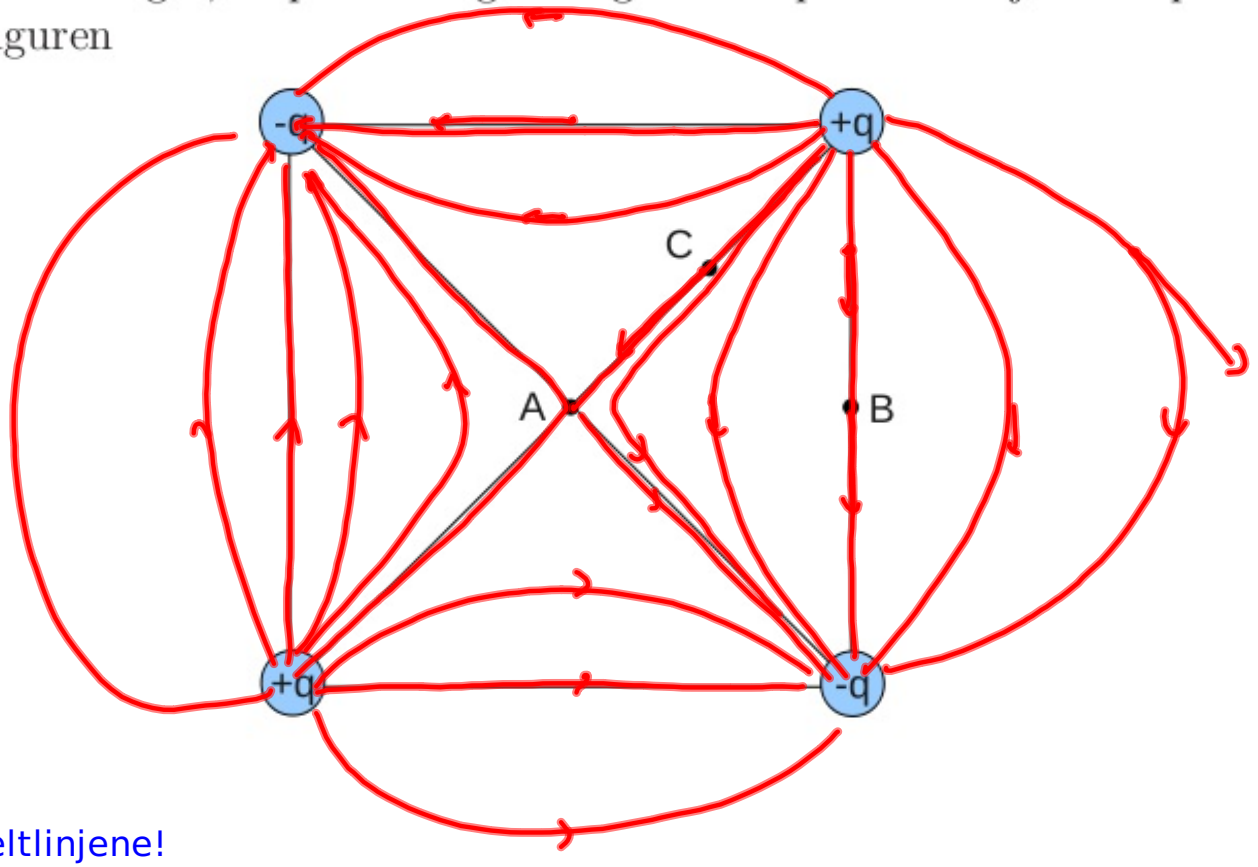
The electric field from an isolated negative charge




−
+
+
+
-Q
-Q

Samsnakk

Fire like store ladninger, to positive og to negative er plassert i hjørnene på et kvadrat som vist på figuren

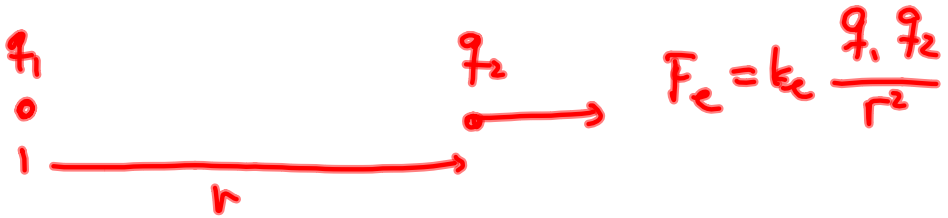


Tegn feltlinjene!

Hvorfor trenger vi felt?

Vi har to ekvivalente beskrivelser:

1 Coulombs lov



2 Elektrisk felt

Hvorfor trenger vi felt?