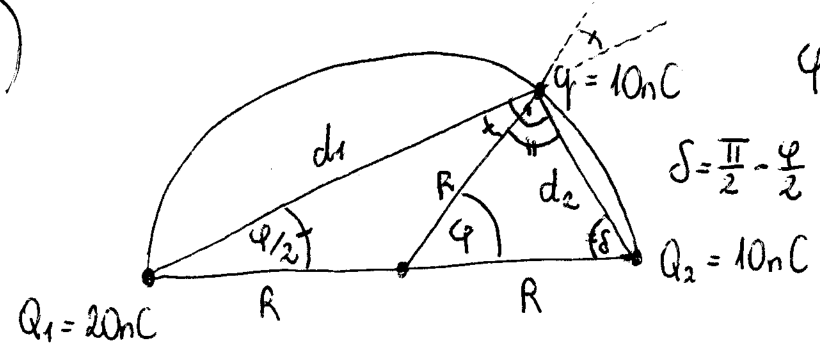
2.)



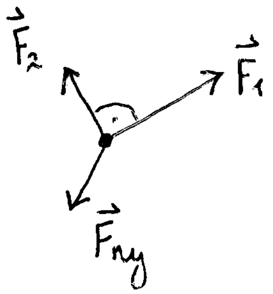
$\varphi = ?$ milyen egyensúly?

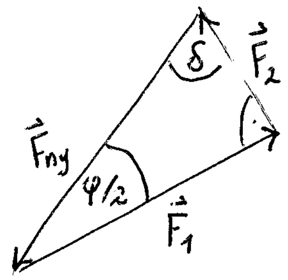
$\delta = \frac{\pi}{2} - \frac{\varphi}{2}$

$$\boxed{\vec{F}_c = k\frac{Q_1 q}{r^2}\vec{e}_r}$$

Coulomb-tv.

$$\boxed{U = \frac{kQq}{r}}$$





$d_1 = 2R\cos\frac{\varphi}{2}$

$d_2 = 2R\sin\frac{\varphi}{2}$

$$\mathrm{tg}\frac{\varphi}{2} = \frac{F_2}{F_1}$$

$$F_2 = \frac{kQ_2 q}{d_2^2} \qquad F_1 = \frac{kQ_1 q}{d_1^2}$$

$$F_2 = \frac{kQ_2 q}{4R^2\sin^2\frac{\varphi}{2}} \qquad F_1 = \frac{kQ_1 q}{4R^2\cos^2\frac{\varphi}{2}}$$

$$\mathrm{tg}\frac{\varphi}{2} = \frac{Q_2}{Q_1}\frac{\cos^2\frac{\varphi}{2}}{\sin^2\frac{\varphi}{2}}$$

$$\mathrm{tg}^3\frac{\varphi}{2} = \frac{Q_2}{Q_1} = \frac{1}{2} \longrightarrow \varphi = \dots \ (\varphi_0)$$

Stabil vagy labilis? Egyensúly: $\frac{dU}{d\varphi} = 0$ $F_e = 0$ ha $\varphi = \varphi_0$

U_{min} U_{max}

$$U = U_1 + U_2 = \frac{kQ_1 q}{d_1} + k\frac{Q_2 q}{d_2} = \frac{kq}{2R}\left(\frac{Q_1}{\cos\frac{\varphi}{2}} + \frac{Q_2}{\sin\frac{\varphi}{2}}\right)$$

$\to U_0 = U(\varphi_0)$

Max, ha $U(\varphi) < U_0$

Min, ha $U(\varphi) > U_0$ $\varphi \neq \varphi_0$