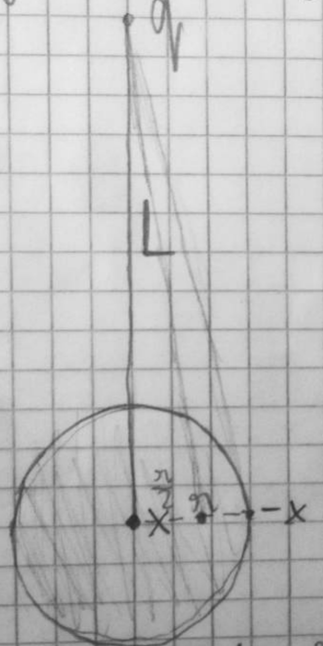
Let us assume (for an estimate) that the charge configuration on the disk is such that there is a charge x in the middle of the disk and a charge $-x$ on the edge of the disk $(x+(-x)=0)$.



In the realistic scenario, the electric field parallel to the disk should be 0. In our model, this fact could be simplified into saying that at the distance $\frac{r}{2}$ from the disk's centre, the electric field should be 0 (parallel to the disk). At this point, there are three fields present. The charge q applies the field $E_q = \frac{q \cdot k}{L^2} \cdot \frac{r}{2L} = \frac{kqr}{2L^3}$. The charge x applies the field $E_x = \frac{x \cdot k}{\left(\frac{r}{2}\right)^2} = \frac{4kx}{r^2}$. The ring of charge $-x$ applies the force $E_{-x} = \frac{2k\lambda}{\frac{r}{2}} = \frac{2kx}{\pi r^2}$ (approximating it as a wire). Since $\frac{4kx}{r^2}$ is much greater than $\frac{2kx}{\pi r^2}$ $\left(\frac{2}{\pi} \ll 4\right)$, we can ignore $\frac{2kx}{\pi r^2}$ (because it is an estimate). Thus $\frac{4kx}{r^2} = \frac{kqr}{2L^3} \Rightarrow x = \frac{qr^3}{8L^3}$. Now we can calculate the total interaction force $F_T = \frac{kqx}{L^2} - \frac{kqx}{(r^2+L^2)\frac{L}{\sqrt{r^2+L^2}}} =$

$$= \frac{kqx}{L^2}\left(1 - \frac{1}{\sqrt{1+\frac{r^2}{L^2}}}\right) = \frac{kqx}{L^2} \cdot \left(\frac{r^2}{2L^2}\right) = \underline{\underline{\frac{kq^2r^5}{16L^7}}}$$