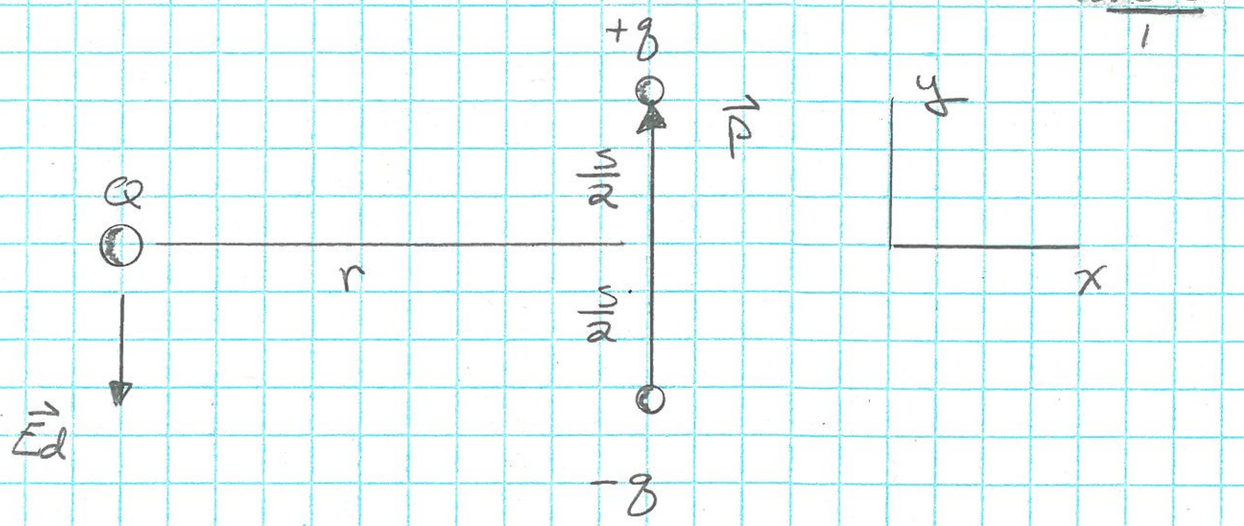

a.) Since $r >> s$, the field of the dipole at the location of Q is

$$\vec{E}_d = -\frac{K\vec{p}}{r^3} \quad \text{(on the bisecting axis)}$$

So:

$$\vec{E}_d = -\frac{Kqs}{r^3}\hat{j}$$

and the force on Q is

$$\vec{F}_Q = Q\vec{E}_d = -\frac{KQqs}{r^3}\hat{j}$$

Now, by Newton's 3rd law:

force on dipole = − (force on Q)

$$= \frac{KQqs}{r^3}\hat{j} \quad \text{(same direction as } \vec{p}\text{)}$$

b.) For a dipole in the field of Q:

$\vec{\tau} = \vec{p} \times \vec{E}$ where at center of dipole $\vec{E} = \frac{KQ}{r^2}\hat{i}$

So

$$|\vec{\tau}| = pE\sin 90° = \frac{KQp}{r^2} = \frac{KQqs}{r^2}$$

RHR ⇒ $\vec{\tau}$ is c.w.