

Zangwill 4.4 Stress Tensor Proof of No Self-Force

Use the electric stress tensor formalism to prove that no isolated charge distribution $\rho(r)$ can exert a net force on itself. Distinguish the cases when $\rho(r)$ has a net charge and when it does not.

Zangwill 4.5 Point Charge Motion in an Electric Dipole Field

Place a point electric dipole $\mathbf{p} = p\hat{z}$ at the origin and release a point charge q (initially at rest) from the point $(x_0, y_0, 0)$ in the $x - y$ plane away from the origin. Show that the particle moves periodically in a semi-circular arc.

Zangwill 4.8 Two Coplanar Dipoles

Two dipoles \mathbf{p} and \mathbf{p}' lie in the $x - y$ plane making angles θ and $-\theta'$, respectively, with the x -axis (i.e. the angle between them is $\theta + \theta'$). Find the equilibrium value of the angle θ' if the angle θ is fixed.