

[lex2] Electric field of a charged ring I

(a) Calculate the electric field of a uniformly charged ring of radius R at points along the axis (line through center and perpendicular to plane of ring). The line charge density (charge per unit length) is λ . Start from the general expression in [ln5] for the electric field of a continuous charge distribution. Then simplify that expression systematically by using (i) a convenient coordinate system (ii) symmetry, and (iii) reduced dimensionality. Plot the expression on a scale that shows all its features.

(b) Infer from the general result asymptotic expressions for a field point close to the center of the ring and a field point far away from the ring showing different power-law dependence on distance.

(c) Find the distance z_0 from the center of the ring where the electric field is strongest.

Solution:

