CP3: Mathematical Methods 1

Additional homework problem

Problem B.1. Positive charge Q is uniformly distributed over an infinitely thin wire shaped as a ring of radius R. The ring is positioned in the XY plane and centred at $(x, y, z) = (0, 0, 0)$.

a) Find the magnitude and direction of the electric field at the point $(0, 0, h)$, where $h \ll R$.

b) Find the magnitude and direction of the electric field at the point $(r, 0, 0)$, where $r \ll R$.

c) Is your result consistent with the divergence theorem applied to the cylinder of radius r and height $2h$, centered at the origin? The base of the cylinder is parallel to the XY plane.