

28. The charge distribution in this problem is equivalent to that of an infinite sheet of charge with surface charge density σ plus a small circular pad of radius R located at the middle of the sheet with charge density $-\sigma$. We denote the electric fields produced by the sheet and the pad with subscripts 1 and 2, respectively. The net electric field \vec{E} is then

$$\begin{aligned}\vec{E} &= \vec{E}_1 + \vec{E}_2 = \left(\frac{\sigma}{2\varepsilon_0}\right)\hat{k} + \frac{(-\sigma)}{2\varepsilon_0}\left(1 - \frac{z}{\sqrt{z^2 + R^2}}\right)\hat{k} \\ &= \frac{\sigma z}{2\varepsilon_0\sqrt{z^2 + R^2}}\hat{k}\end{aligned}$$

where Eq. 23-26 is used for \vec{E}_2 .