54. Studying Sample Problem 23-3, we see that the field evaluated at the center of curvature due to a charged distribution on a circular arc is given by

$$\vec{E} = \frac{\lambda}{4\pi\varepsilon_0 r}\left[\sin\theta\right]_{-\theta/2}^{\theta/2} \qquad \text{along the symmetry axis}$$

where $\lambda = q/\ell = q/r\theta$ with θ in radians. Here ℓ is the length of the arc, given as $\ell = 4.0$ m. Therefore, $\theta = \ell/r = 4.0/2.0 = 2.0$ rad. Thus, with $q = 20 \times 10^{-9}$ C, we obtain

$$\left|\vec{E}\right| = \frac{q}{\ell}\,\frac{1}{4\pi\varepsilon_0 r}\left[\sin\theta\right]_{-1.0\,\text{rad}}^{1.0\,\text{rad}} = 38 \text{ N/C} .$$