Consider a uniformly charged thin rod bent into a semicircle of radius $R$.

Find the electric field generated at the origin of the coordinate system.

- Charge per unit length: $\lambda = Q / \pi R$
- Charge on slice: $dq = \lambda R d\theta$ (assumed positive)
- Electric field generated by slice: $dE = k \frac{|dq|}{R^2} = \frac{k |\lambda|}{R} d\theta$
  directed radially (inward for $\lambda > 0$)
- Components of $dE$: $dE_x = dE \cos \theta$, $dE_y = -dE \sin \theta$
- Electric field from all slices added up:

\[
E_x = \frac{k \lambda}{R} \int_{0}^{\pi} \cos \theta d\theta = \frac{k \lambda}{R} \left[ \sin \theta \right]_{0}^{\pi} = 0
\]

\[
E_y = -\frac{k \lambda}{R} \int_{0}^{\pi} \sin \theta d\theta = \frac{k \lambda}{R} \left[ \cos \theta \right]_{0}^{\pi} = -\frac{2k \lambda}{R}
\]