Two rods of nonconductor are placed at right angles. The rods each have a total charge of 3.25 x 10^{-6} C that is uniformly distributed and their length is L = 1.25 m. Calculate the electric field, magnitude and direction, at point P. P, together with the ends of the rods, form a square of side L.

Choose coordinate system as shown below.

For Rod 1:

\[ \lambda = \frac{3.25 \times 10^{-6}}{1.25} = 2.6 \times 10^{-6} \text{ N/m} \]

Choose origin at L.

\[ \cos \theta = \frac{L}{r} = \frac{L}{\sqrt{(L-y)^2 + L^2}} \]

\[ \sin \theta = \frac{L-y}{r} = \frac{L-y}{\sqrt{(L-y)^2 + L^2}} \]

\[ E_x = \int dE_x = k \int \frac{\lambda dy}{r^2} \cos \theta = k \int_0^L \frac{\lambda dy}{[(L-y)^2 + L^2]^{3/2}} \]

\[ E_y = \int dE_y = k \int \frac{\lambda dy}{r^2} \sin \theta = k \int_0^L \frac{\lambda (L-y) dy}{[(L-y)^2 + L^2]^{3/2}} \]

For Rod 2:

\[ E_x = \int dE_x = k \int \frac{\lambda dy}{r^2} \cos \theta = k \int_0^L \frac{\lambda dy}{[(L-y)^2 + L^2]^{3/2}} \]

\[ E_y = \int dE_y = k \int \frac{\lambda dy}{r^2} \sin \theta = k \int_0^L \frac{\lambda (L-y) dy}{[(L-y)^2 + L^2]^{3/2}} \]