Vector Field and Electric Field Lines

- The electric field is a vector field:

$$\vec{E}(\vec{r}) = \vec{E}(x, y, z) = E_x(x, y, z)\hat{i} + E_y(x, y, z)\hat{j} + E_z(x, y, z)\hat{k}$$

- Electric field lines: graphical representation of vector field.

- Properties of electric field lines (electrostatics):
  - Electric field lines begin at positive charges or at infinity.
  - Electric field lines end at negative charges or at infinity.
  - The direction of $\vec{E}$ is tangential to the field line going through the field point.
  - Electric field lines bunched together indicate a strong field.
  - Electric field lines far apart indicate a weak field.
  - Field lines do not intersect.