Equipotential Surfaces and Field Lines

- Definition: $V(\vec{r}) =$ const on equipotential surface.
- Potential energy $U(\vec{r}) =$ const for point charge q on equipotential surface.
- The surface of a conductor at equilibrium is an equipotential surface.
- Electric field vectors $\vec{E}(\vec{r})$ (tangents to field lines) are perpendicular to equipotential surface.
- Electrostatic force $\vec{F} = q\vec{E}(\vec{r})$ does zero work on point charge q moving on equipotential surface.
- The electric field $\vec{E}(\vec{r})$ exerts a force on a positive (negative) point charge q in the direction of steepest potential drop (rise).
- When a positive (negative) point charge q moves from a region of high potential to a region of low potential, the electric field does positive (negative) work on it. In the process, the potential energy decreases (increases).