＊請列出各步驟及計算過程、或詳細說明，否則不予計分。

1. （40分） Charge is distributed uniformly, with a surface charge density σ (σ = charge per unit area = dQ/dA), over a thin circular disk of radius R.
   (a) Use Coulomb's law to determine the electric field at a point P on the axis of the disk, a distance z above its center.
   (b) From (a), what is the electric field at point P if $z << R$?
   (c) Use Gauss's law to verify your answer of (b).
   (d) Two such planes are parallel separated by a distance d ($d << R$). One carries a uniform surface charge density σ and the other carries a uniform surface charge density $-\sigma$. Find the electric field between these two planes.
   (e) Find the potential difference between the two planes described in (d).

2. （30分） Find the magnetic field and the vector potential produced by an infinite solenoid with n turns per unit length, radius R, and carrying a steady current I.

3. （30分） A long coaxial cable carries current I (the current flows down the surface of the inner cylinder, radius a, and back along the outer cylinder, radius b).
   (a) Find the magnetic field between the cylinders.
   (b) Find the energy stored in a section of length l.
   (c) Find the self-inductance per unit length.