

**Review Homework
Fields and Waves I
Due December 7, 2000**

1. A long line charge is placed on the x axis of 6×10^{-6} C/m. Find the total flux of the electric field through a sphere centered at the origin and having a radius of 2 m.
2. An infinite current sheet is located on the $y=0$ plane. The surface current density is 10 A/m². Find the magnetic flux density at the point (1,1,1).
3. In a Cartesian coordinate system, the plane $z=2$ has applied potential $V=-30$. The plane $z=1$ has applied potential $V=100$. Solve Laplace's equation in the region between the planes.
4. A sphere made of a particular material which occupies the region $r < 1$ has a flux density $D = 2 \times 10^{-8} r \vec{a}_r$. There is a surface charge on the sphere $\rho_s = 10^{-8}$ C/m². The sphere is surrounded by material 2. Find the normal flux density at the surface of the sphere in material 2.
5. A transformer core has a cross sectional area of 5 cm². We apply 60 Hertz voltage of 120 Volts RMS. The core material saturates at 1.8 Tesla. How many turns are required to keep the flux density under this value?
6. A coax cable has $\epsilon_r = 4$ and inner conductor radius of 1.0 mm and outer conductor radius of 5.0 mm. We apply a voltage of $V = 100 \cos(12\pi \times 10^6 t)$. Find the displacement current per meter of length.