

Homework 10
EE 381 Electric & Magnetic Fields (Fall 2025)
Wednesday, November 5, 2025

- 1) 5.3 Draw fully labeled picture of surface.
- 2) 5.8 First, find the wire resistance and magnitude of the current density in the wire. For part a), determine magnitude of the electric field.
- 3) 5.20 Also, determine the electric susceptibility.
- 4) 5.24 Hint: Use Gauss' Law to find electric field and electric flux density for $a < r < b$.
- 5) 5.34
- 6) 5.36 Also, determine the relaxation time for the dielectric sphere.
- 7) 5.39 First, find $\bar{E}_1$ and $\bar{D}_1$.
- 8) A conductor-dielectric interface is defined by plane $-2x + y = 6$ m. Region 1, which includes the origin, has a relative permittivity of $\epsilon_{r1} = 2.1$ (Teflon) and an electric field which points away from the conductor with magnitude $|\bar{E}_1| = 4800$ V/m. Region 2 is the conductor. Draw a side view picture of the problem geometry (i.e., x - y plane). Then, determine: a) unit vectors $\hat{a}_{n,12}$ and $\hat{a}_{n,21}$ normal the interface, b) electric field, flux density, & polarization vectors in region 1, c) surface charge density at the interface, and d) energy density in region 1.

Due Monday, November 10, 2025

- See Appendix B for material properties if they are not given in the problem.
- Can use the gradient function to find surface normal(s).
- If not otherwise specified, assume units of meters for all positions and distances.
- Every problem should include a sketch of the problem geometry (if applicable).