Electricity and Magnetism, PHYS 350 Problem set 4:

(edition 4 corrected)

1. Problem 4.15 (4.15).
2. Problem 4.16 (4.16).
3. A plane slab of material with dielectric constant K_1 is bounded on both sides by a material of dielectric constant K_2. The electric field in medium 2, $\underline{E}_2$, is given to be uniform and perpendicular to the boundaries. Find (a) the field $\underline{E}_1$, (b) the polarisation $\underline{P}_1$, and c) the bound charge in medium 1.
4. Problem 4.29 (4.29).
5. Problem 4.41 (4.38).
6. Problem 5.3, (5.3).
7. Problem 5.10 (5.10).
8. Problem 5.11 (5.11).
9. Problem 5.14 (5.13).
10. Problem 5.20 (5.19).
11. Problem 5.22 (5.22).
12. Problem 5.25 (5.24).
13. Consider a volume current in a slab infinite in the x, y directions and that varies in the z direction and points in the x direction:

$$\underline{J}(x,y,z) = \begin{cases} \hat{x}\left(\dfrac{j_0|z|}{a}\right); & -a \le z \le a \\ 0 & \textit{otherwise} \end{cases}$$

a) What is $\underline{B}$ inside the slab, and above and below it?
b) Sketch a plot of $B_y(z)$.

Supplementary problems D:

D1. Problem 4.22 (4.22).
D2. Problem 4.24 (4.24)
D3. Problem 4.36 (4.33).
D4. Problem 5.6 (5.6).
D5. Problem 5.9 (5.9).
D6. Problem 5.16 (5.15).
D7. Problem 5.30 (5.29).

(Numbers from Griffiths book 4th edition; 3rd edition numbers in parentheses)