8.07 Practice problems

Problem 1. Griffiths 6.25, part (a) (p.283)

Problem 2. Griffiths 7.28 (p.320)

Problem 3. Griffiths 8.3 (p.355) Answer in p.248.

Problem 4. Griffiths 10.9 (p.426)

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The following exercises are on relativity. All except (5) are solved using the transformation laws:

$$\mathbf{E}'_{||} = \mathbf{E}_{||}\,, \qquad \mathbf{E}'_{\perp} = \gamma\,(\mathbf{E}_{\perp} + \mathbf{v}\times\mathbf{B}_{\perp})$$

$$\mathbf{B}'_{||} = \mathbf{B}_{||}\,, \qquad \mathbf{B}'_{\perp} = \gamma\,(\mathbf{B}_{\perp} - \frac{1}{c}\mathbf{v}\times\mathbf{E}_{\perp})$$

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Problem 5. Griffiths 12.48 (p.537).

Problem 6. Suppose that in an inertial frame S there is a uniform electric field $\mathbf{E} = E_0\hat{\mathbf{z}}$. What are the fields in a frame S' boosted along the x-axis of S with a velocity v. *Answers:* nonvanishing fields are $E'_z = \gamma E_0$, $B'_y = \frac{\gamma v}{c^2}E_0$.)

Problem 7. Suppose that $\mathbf{B} = 0$ in an inertial frame S, then prove that

$$\mathbf{B}' = -\frac{1}{c^2}\mathbf{v}\times\mathbf{E}'$$

in a frame S' boosted with velocity $\mathbf{v}$ with respect to S. Note that in the above equation both vectors are in the frame S', and there are no $\perp$ nor $||$ labels.

Problem 8. Griffiths 12.46 (p.534). You can use equations (12.108), or if you prefer, the above more general vector transformation laws.