Math 453 − Homework 8

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Friday, April 21, 2017

This assignment is due on **Friday, April 21, at 11:50 AM**

Reading: Sections 2.4.1(a)(b)(c) (we'll skip (d) and (e) because the techniques are similar)

Chapter 2: 19(a)(b)(c), 21, 22

Note for 21: For 21(a), only do the proof for E^1 and B^1, because the other cases are similar. For 21(b), only do the proof for w and w^1 (where $\mathbf{w} = (w^1, w^2, w^3)$), because the other cases are similar.

I'd like to "remind" you that the curl of a vector field $\mathbf{F} = (F^1, F^2, F^3)$ is

$$\text{curl}(\mathbf{F}) = \nabla \times \mathbf{F} = (F^3_{x_2} - F^2_{x_3}, F^1_{x_3} - F^3_{x_1}, F^2_{x_1} - F^1_{x_2})$$

And the divergence of $\mathbf{F}$ is

$$\text{div}(\mathbf{F}) = \nabla \cdot \mathbf{F} = F^1_{x_1} + F^2_{x_2} + F^3_{x_3}$$

One way to do this problem is to write down the PDE mean (in terms of components), rolling up your sleeves, and doing the computation. There's probably a quicker way, but this way is more straightforward.

Note for 22: For 22, just do the proof for u (since v is similar). I'd recommend just playing around with the two PDE by differentiating them, subtracting them etc.