

MAT 1060: Partial Differential Equations I

Assignment 6, November 28 2007

Read Sections 5.1-5.7 of Evans. Start with the definition and the properties of the weak derivative in Section 5.2. In Sections 5.6 and 5.7, concentrate on the the statements of the Sobolev inequality on p. 263, Morrey's inequality on p. 266, and the Rellich-Kondrachev compactness theorem on p. 272. (Omit the more technical results). We will discuss the main ideas of the proofs in class. As supplementary reading, you may enjoy Chapters 6 and 9 of Folland's *Real Analysis*, and Chapters 2, 6 and 8 of Lieb and Loss' *Analysis*. Lieb and Loss also have nice treatments of harmonic functions (Chapter 9) and Poisson's equation (Chapter 10).

Please hand in to Wenbin Kong's mailbox by noon on Friday, December 7:

- Chapter 5 (p. 289): Problems 5, 6, 8 (replaces 9), 10, 16, 17.

In Problem 16, keep in mind that v_{x_i} is a *weak* derivative. In Problem 17, I'd suggest to start with (ii), and then write

$$u = u^+ - u^-, \quad |u| = u^+ + u^-$$

to get (i) and (iii). Consider only the cases $1 < p < \infty$.