

Assignment 2

Math 2413

August 20, 2008

1. Read bogus §2.1.
2. Look at the bogus problems 2.1.1, 3, 6, 7, 10, 12, 17, 18, 22, 26, 35.
3. Let $f : [0, 1] \rightarrow \mathbb{R}$ be a continuous function such that $\int_0^1 f(t)\eta(t)dt = 0$ for all $\eta \in C_c^\infty[0, 1]$. What can you say about f ?

Notes:

- (a) Here we could simply write $f \in C^0[0, 1]$.
 - (b) C^∞ denotes the functions which have derivatives of all orders, both existing and continuous.
 - (c) C_c^∞ denotes the subspace of C^∞ of the functions with *compact support*. The *support* of a function is the closure of the set of all points at which the function is non-zero. To be *compactly supported* means that the support of the function is compact (i.e., closed and bounded) and is also a subset of the interior of the domain of the function. In this case, it means that $\text{supp}(f) \subset (0, 1)$. In this case, we write $\text{supp}(f) \subset\subset [0, 1]$.
4. Find a nonzero function in $C_c^\infty[0, 1]$.
 5. Vocabulary: differentiation under the integral sign, fundamental lemma (of the calculus of variations), C^k , C^∞ , C_c^∞ , compact support, closure, closed/open (sets), continuously differentiable (C^1), compactly contained ($\subset\subset$), continuity (review), numerical solution, tangent line (review), slope (review), slope field, difference quotient (review), limit

(review), piecewise linear, step size, Euler's method, round off error, Runge-Kutta method (will understand more fully later).