

Fall, 2009

MATH 3500(H)
PROBLEM SET #6

T. Shifrin

DUE Wednesday, September 30, 2009.

Problems to work but not hand in:

§3.1: #1a,c, 2a,b, 3a.

§3.2: #1a,f, 2a,e, 3, 4.

Problems to turn in:

§2.3: #3 (3), 5 (2), 8f,g,h (3), 13 (2), 15 (3).

WeBWork Homework 6

§3.1: #5 (2), 8* (3), 10 (3).

§3.2: #5 (2), 8 (3), 17 (3).

A. (3) Show that for any $\mathbf{a} \neq \mathbf{0}$ we have

$$\lim_{\mathbf{h} \rightarrow \mathbf{0}} \frac{\|\mathbf{a} + \mathbf{h}\| - \|\mathbf{a}\| - \frac{\mathbf{a} \cdot \mathbf{h}}{\|\mathbf{a}\|}}{\|\mathbf{h}\|} = 0.$$

(Hint: Remember that $x - y = \frac{x^2 - y^2}{x + y}$. This is the same “conjugate trick” you used numerous times in single-variable calculus.)

If $f(\mathbf{x}) = \|\mathbf{x}\|$, is f differentiable at $\mathbf{a} \neq \mathbf{0}$?

Challenge problems (Turn in separately):

§2.3: #8i (3), 14 (2), 16 (4), 17 (4).

§3.1: #13 (3).

§3.2: #19 (5).

B. (3) Give a criterion (in terms of α , β , γ , and δ) for the function in §2.3, #17 to be differentiable at $\mathbf{0}$.

*Don't forget the single-variable chain rule!