

**Assignment #13, notes and hints**  
(last updated 4/26)

*Problem 12.4.13* This exercise was discussed in reasonable detail in class.

*Problem 12.5.2* This is very similar to Example 12.30, except that now there are three intermediate variables  $x, y, z$  rather than two. It is most instructive to express this instance of the Chain Rule as a product of a row vector (gradient of  $w$  and the  $3 \times 2$  Jacobian matrix of partial derivatives (of  $x, y, z$  with respect to  $s, t$ , cf. Eq. (103) in the text).

*Problem 12.6.11* Use Theorem 12.50 (make sure that you verify the hypotheses).

*Problem 12.8.2* This is very simple; use either one of the Eq. (101), (102) or the Carathéodory's Lemma.

*Problem 12.8.11 (a), (b)* This is a calculus level problem, but at the appropriate point in the argument it should be noted that all the partial derivatives that appear are continuous, which implies differentiability.