

# MA 426-003/591M-003 Homework

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Assigned October 18, 2002, Due October 25, 2002

1. Sec. 6.4 problem 2. Here are the steps
  - (a) Show  $f$  is continuous at  $(0, 0)$ .
  - (b) Find all directional derivatives of  $f$  at  $(0, 0)$ .
  - (c) Is  $f$  differentiable at  $(0, 0)$ ? Justify your answer.
2. Sec. 6.5 problem 2. “Verify” means compute  $\frac{\partial h}{\partial x}$ ,  $\frac{\partial h}{\partial y}$ , and  $\frac{\partial h}{\partial z}$  both (1) directly and (2) using the chain rule. Just do  $\frac{\partial h}{\partial x}$ .
3. Sec. 6.5 problem 3.
4. Sec. 6.5 problem 5.
5. Suppose  $r : \mathbf{R}^n \rightarrow \mathbf{R}^m$  is  $o(h)$  and  $s : \mathbf{R}^m \rightarrow \mathbf{R}^p$  is  $\mathcal{O}(k)$ . Show that  $s \circ r$  is  $o(h)$ .
6. Sec. 6.7, problem 5. For  $f : \mathbf{R}^n \rightarrow \mathbf{R}$ ,  $\text{grad } f(x)$  is just  $Df(x)^\top$ . Hint: Mean Value Theorem plus Cauchy-Schwartz inequality.