

MATH 4320
ADVANCED CALCULUS II
FINAL EXAM
DUE MAY 15 , 2008

1. Let $f(x, y) = xy^2 + 2x^2y - 6xy$
 - (a) Locate the critical points of $f(x, y)$ and determine if they are local maxima, minima, or neither.
 - (b) Find the first and second order approximations of $f(x, y)$ at the point $(1, -1)$.
2. Let $F : \mathfrak{R}^n \rightarrow \mathfrak{R}$ be continuously differentiable. Show that at each point $x \in \mathfrak{R}^n$ there is a direction h_x so that the directional derivative is 0, i.e., $\frac{\partial f}{\partial h_x}(x) = 0$. Is there a unique h_x so that $\|h_x\| = 1$? Give a method for determining h_x .
3. Problem 17 in section 13.2.