241 Exam 4 Fall 2001 127

PRINT Your Name:_____

There are 8 problems on 5 pages. Problems 1 through 7 are each worth 10 points. Problem 8 has three parts; each part is worth 10 points. SHOW your work. $\boxed{CIRCLE}$ your answer. **NO CALCULATORS! Check your answer whenever possible.** If you want to pick up your exam before Tuesday, write a short note to that effect on the top of this page and I will leave your exam outside my office door, before I go home tonight.

1. If $f(x,y) = xe^{xy}$, then find $\vec{\nabla} f$.

$\vec{\nabla} f = (xye^{xy} + e^{xy})\vec{i} + x^2 e^{xy}\vec{j}$

2. Find the directional derivative of $f(x,y) = x^2y$ at $(1,2)$ in the direction $\vec{u} = \frac{3}{5}\vec{i} - \frac{4}{5}\vec{j}$.

$D_{\vec{u}} f|_{(1,2)} = \vec{\nabla} f|_{(1,2)} \cdot \vec{u} = (2xy\vec{i} + x^2\vec{j})|_{(1,2)} \cdot \vec{u} = (4\vec{i} + \vec{j}) \cdot (\frac{3}{5}\vec{i} - \frac{4}{5}\vec{j})$

$= \frac{12}{5} - \frac{4}{5} = \frac{8}{5}$