MAT2500-03/04 10S Test 2 Print Name (Last, First) _____|__

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use arrows and equal signs when appropriate. Always simplify expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation). Indicate where technology is used and what type(Maple, GC). You are encouraged to use technology to check all of your hand results.

1. a) Find the equation of the tangent plane to the level surface of the function $f(x, y, z) = \frac{x+y}{z}$ at the point $(1, 1, -1)$.
Identify a (simplest) normal vector $\vec{n}$ to this plane. What is the equation of this level surface?
b) Evaluate the directional derivative of f along $\vec{u} = \langle 1, 2, 2 \rangle / 3$ at the point $(1, 1, -1)$.
c) In which direction (unit vector $\vec{v}$) is this function increasing the most rapidly at the same point?
d) What is the linear approximation function $L(x, y, z)$ to f at this point? Use it to approximate
$f(1.01, 0.98, -1.02)$
to 2 decimal places.

2. $z = e^{x-y}\cos(x+y)$.
a) Find an equation for the tangent plane at $(x, y, z) = (0, 0, 1)$.
b) What is a (simplest) normal vector $\vec{n}$ for this plane?
c) What are the equations for the normal line to this surface at the same point?

3. $f(x, y) = x\,y\,e^{-x^2-y^2}$
a) Find the two critical points of f for which $0 \le x \le 1$, $0 \le y \le 1$. Remember to factor your derivatives before trying to solve the derivative conditions.
b) Use the second derivative test to classify both of these critical points as local minima, local maxima or saddle points. Use words to explain your reasoning.

▶ solution

▼ pledge

When you have completed the exam, please read and sign the dr bob integrity pledge and hand this test sheet stapled on top of your answer sheets as a cover page, with the first test page facing up:
"During this examination, all work has been my own. I have not accessed any of the class web pages or any other sites during the exam. I give my word that I have not resorted to any ethically questionable means of improving my grade or anyone else's on this examination and that I have not discussed this exam with anyone other than my instructor, nor will I until after the exam period is terminated for all participants."

Signature: Date: