

MA 227, CALCULUS III
 Fall, 2010

Name (Print last name first):

Student Signature:

TEST II

10 questions, 10 points each.

SHOW ALL YOUR WORK! CIRCLE YOUR ANSWER!

Question 1

Find the gradient of the function $f(x, y) = xye^{-y}$ at the point $(2, 0)$.

Question 2

Find the directional derivative of the function $f(x, y, z) = yz - xy^2$ in the direction of the vector $\vec{v} = 2\vec{i} - \vec{j} + 2\vec{k}$ at the point $(1, 2, 1)$.

Question 3

Find local maximum, minimum and saddle points (if any) of the function

$$f(x, y) = 2x^2 - 4xy - y^2 + 3y - 2.$$

Question 4

Let $z = x^2y^2 + \frac{y}{x}$. Find equation of the tangent plane at point $(1, -2)$.

Question 5

Find linear approximation for the function

$$f(x, y) = 2x^3 + x + y^2x$$

near point $(1, -1)$.

Question 6

Let $f(x, y) = xy^2 - x^2y$ and $x = s + t^2$, $y = s^3t$. Find partial derivatives $\frac{\partial f}{\partial s}$ and $\frac{\partial f}{\partial t}$.

Question 7

Let $f(x, y) = x \cos(y) - x^2y^2$. Find all second partial derivatives: f''_{xx} , f''_{xy} , f''_{yy} .

Question 8

Find equation of the tangent plane to the surface $x^2 + y^2 - z^2 = -2$ at the point $(1, -1, 2)$.

Question 9

Find the maximum rate of change of $f(x, y) = x^2y^3 + 4\sqrt{y}$ at the point $(-1, 1)$. In which direction does it occur?

Question 10

Find the absolute maximum and absolute minimum of the function $f(x, y) = x^2 + y^2 - 4y - 2$ on the region $-1 \leq x \leq 1$, $0 \leq y \leq 3$. Be sure to provide coordinates of the points and the values of absolute maximum and minimum.