

Due Date: April 20, 2012 Friday class time

NAME:.....

Ali Sinan Sertöz

STUDENT NO:.....

Math 114 Calculus – Homework 4

1	2	3	4	TOTAL
25	25	25	25	100

Please do not write anything inside the above boxes!

Check that there are 4 questions on your booklet. Write your name on top of every page.

Show your work in reasonable detail. A correct answer without proper reasoning may not get any credit.

Everything you write on your paper should be part of a well constructed sentence. No hanging equations will be read. No sequence of equations will be read unless they are part of a well constructed, meaningful sentence.

Q-1) Read Theorem 8 on page 731. Then examine Example 3 on page 738. Now show that the equation $\frac{1+x+y^3}{1+x^3+y^4} = 1$ has a solution of the form $y = f(x)$ near $x = 0$ satisfying $f(0) = 1$, and find the terms up to fifth degree for the Taylor series for $f(x)$ in powers of x

Solution:

NAME:

STUDENT NO:

Q-2) Let $f(x, y, z) = (x^2 + y^2) \ln(1 + y^2) + yz + xz^3$. Let P_0 be the point $(1, 0, 2)$.

- (i) Find the gradient of f at P_0 .
- (ii) Find the linearization of f at P_0 .
- (iii) Find the equation for the tangent plane at P_0 to the level surface of f through P_0 .
- (iv) If a bird flies through P_0 with speed 5, heading directly toward the point $(2, -1, 1)$, what is the rate of change of f as seen by the bird as it passes through P_0 ?
- (v) In what direction from P_0 should the bird fly at speed 5 to experience the greatest rate of increase of f ?

Solution:

NAME:

STUDENT NO:

Q-3) Find all local/global minimum and maximum points of $f(x, y) = x^4 + 24y^2 - 4xy^3$, if they exist.
Also find any saddle points if they exist.

Solution:

NAME:

STUDENT NO:

Q-4) Among all the ellipsoids of the form

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

which pass through the point $(2, 1, 3)$, find the ones with the minimum and the maximum volumes, if they exist.

Solution: