**Math 201** Quiz II (Time: 65 minutes) (Fall 2012) *N. Nahlus, R. Nassif, F. Mroue, Z. Rawas*

**Name:** ……………………………………….. (VERY CLEARLY)

**I.D** ...........................................

**Circle your Section** number ( -3 points if incorrect)

 **Sec 8 (12:30T) — Sec 9 (2:00 T) — Sec 10 (11:00 T) — Sec 11 (5:00 T) ---**

 **Sec 12 (9:00M) — Sec 13 (3:30 R) — Sec 14 (10:00 M) — Sec 15 (5:00 R) ---**

1. (24%) The function  at a point P **de**creases most rapidly in the direction of

**v = i+j+3k**. In this direction, the value of the derivative is  Find

(i) 

(ii) Find  where **w = 2i+2j+k**

(iii) Is there a unit vector u such that 

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| --- | --- |
|  Problem 1 24% |  |
|  Problem 2 26% |  |
|  Problem 3 25% |  |
|  Problem 4 25% |  |
|  **Total over 100** |  |

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 **Use page 2 (if necessary)**

2a) (*7%*) Given that and the components of  are never zero,

**Find** given that  (Justify your answer).

(**Hint**: Use the known formulas about 

2b) (8%) Suppose 2 

. Find the Tangent plane to the level surface of F at P.

(Hint: You need f(P)=2).

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2c) (11%) Use **Lagrange multipliers** to find the absolute maximum and minimum of the function. 

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 **Continue on Back (if necessary)**

**3a)** (10%) Investigate any 2 critical points (any 2 critical points )(of your choice) of the function



for local maxima, local minima, saddle points.

3b) (10%) Check that 

Then show that 

3c) (5%) Find, if it exists, 

4ab**)** (5*%, 6%)* Let $f\left(x,y\right)=\sqrt{16-x^{2}-y^{2}}+5x+5y$

a) By any method, show that (0,0) =5.

Then, by symmetry, we have (0,0) =5 (Do not prove it)

 b) From definitions, show that *f* is differentiable at (0,0).

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4c) (6%) Given a differentiable function *f*(x,y) such that ∇*f*(1,2)=3**i**+4**j.**

Approximate/Estimate the change in *f* when we move from the point  by using any method.

4d) (8%) Let  (where f (u,v) is a sufficiently differentiable function).

Find 