

## Quiz 4

May 01, 2014

Show all details.

1. Let  $f(x, y) = x^2 + xy + y^2$ . Find the direction  $(\cos \theta, \sin \theta)$  for which the directional derivative  $D_{(\cos \theta, \sin \theta)}f(1, 1)$  is smallest.

2. Find the equation of plane normal to the following curve at  $(1, 1, -1)$

$$\begin{cases} x^2 + 2y^2 + 3z^2 = 6 \\ x + y - z = 3 \end{cases}$$

3. Find all critical points of  $f(x, y) = x^3y^2$  and determine whether they are local min, local max or neither.

4. Use Lagrangian multipliers (and not other methods) to find extreme values of  $f(x, y, z) = xy + z^2$  on  $x^2 + y^2 + z^2 = 16$ .

5. Suppose that  $f(x, y)$  and all its partial derivatives of any order are all continuous. DERIVE Taylor's formula at  $(0, 0)$  up to second order. That is,  $f(x, y) = p_2(x, y) + R_2(x, y)$ , derive formula for the quadratic polynomial  $p_2$  and the remainder term  $R_2$ .

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