NAME:

QUIZ 5 FOR MATH 2551 F1-F4, OCTOBER 3, 2018

This quiz should be taken without any notes and calculators. Time: 20 minutes. Show your work, otherwise credit cannot be given.

Problem 1: (3 points) Find the equation for the plane tangent to the surface $x^2+y^2+z^2=3$ at the point $(1,1,1)$.

Set $f(x,y,z)=x^2+y^2+z^2$. At the point $(1,1,1)$

$$\nabla f = \langle 2,2,2\rangle.$$

Tangent plane

$$2(x-1)+2(y-1)+2(z-1)=0\ .$$

Problem 2: (4 points) Find the the parametric equations for the line tangent to the curve of intersection of the surfaces $xyz=1$ and $x^2+2y^2+3z^2=6$ at the point $(1,1,1)$.

Set $f(x,y,z)=xyz$ and $g(x,y,z)=x^2+2y^2+3z^2$ then then at the point $(1,1,1,)$

$$\nabla f = \langle 1,1,1\rangle\ ,\ \nabla g = \langle 2,4,6\rangle$$

Direction of line

$$\langle 1,1,1\rangle \times \langle 2,4,6\rangle = \langle 2,-4,2\rangle$$

Point on the line$(1,1,1)$ so

$$x=1+2t\ ,y=1-4t\ ,1+2t$$

Note that the parametrization is not unique, e.g.,

$$x=1+t\ ,y=1-2t\ ,1+2t$$

would be fine too.

Problem 3: (3 points) Find the linearization $L(x,y)$ of the function $f(x,y)=x^2+y^2+1$ at the point $(1,1)$. The partials at the point $(1,1)$ are

$$f_x(1,1)=2,\ f_y(1,1)=2$$

and hence the linearization is given by

$$L(x,y)=f(1,1)+f_x(1,1)(x-1)+f_y(1,1)(y-1)=3+2(x-1)+2(y-1)\ .$$