

## Math 241, Sections BL1 and BL2

### Quiz # 2      BDD

September 25, 2012

Solve both exercises. Show work to get credit.

1) [5pts.] Find an equation of the tangent plane to the surface  $z = 4(x - 1)^2 + 6(y + 3)^2 + 4$  at the point  $(2, -2, 14)$

**Solution:** We compute

$$\begin{aligned}\frac{\partial z}{\partial x}(2, -2) &= 8(x - 1)|_{(x,y)=(2,-2)} = 8, \\ \frac{\partial z}{\partial y}(2, -2) &= 12(y + 3)|_{(x,y)=(2,-2)} = 12.\end{aligned}$$

Hence an equation of the tangent plane is

$$z - 14 = 8(x - 2) + 12(y + 2).$$

2) [5pts.] Use the equation  $\sin(xyz) = x + 5y + 8z$  to find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial z}{\partial y}$

**Solution:** Let  $F(x, y, z) = x + 5y + 8z - \sin(xyz)$ . Then our discussion on the Implicit Function Theorem tells us that

$$\begin{aligned}\frac{\partial z}{\partial x} &= -\frac{F_x}{F_z} \\ &= -\frac{1 - yz \cos(xyz)}{8 - xy \cos(xyz)}, \\ \frac{\partial z}{\partial y} &= -\frac{F_y}{F_z} \\ &= -\frac{5 - xz \cos(xyz)}{8 - xy \cos(xyz)}.\end{aligned}$$