3. Find the equations of **any** line which is parallel to $2x - 3y + 4z = 12$.

(0,0,0) is not on the plane

$3\vec{i} + 2\vec{j}$ is // to the plane

$$\begin{cases} x = 3t \\ y = 2t \\ z = 0 \end{cases}$$

4. Find the equations of the plane tangent to $z = x^2 + y^2$ when $x = 1$ and $y = 2$.

the point is $(1, 2, 5)$

$\vec{\nabla}$ are $\perp$ level sets

my surface is the level set

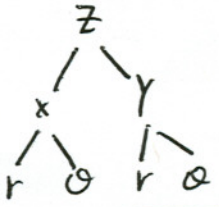
$0 = x^2 + y^2 - z$

The relevant $\vec{\nabla}$ is $2x\vec{i} + 2y\vec{j} - \vec{k}$

$\vec{\nabla}|_{pt} = 2\vec{i} + 4\vec{j} - \vec{k}$

tan plane is $2(x-1) + 4(y-2) - (z-5) = 0$

5. Suppose that $z = f(x, y)$, and x and y are writen polar coordinates (that is, $x = r\cos\theta$ and $y = r\sin\theta$). Express $\dfrac{\partial z}{\partial \theta}$ in terms of $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$.



$$\frac{\partial z}{\partial \theta} = \frac{\partial z}{\partial x}(-r\sin\theta) + \frac{\partial z}{\partial y} r\cos\theta$$