~~the range of acceptable vectors falls in the tangent plane.~~
We can then unravel the expression to obtain the equation of the tangent plane.

Normal vector $= \begin{pmatrix} 2 \\ 2 \\ 2 \end{pmatrix}$ vector based at $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ is $\begin{pmatrix} x-1 \\ y-1 \\ z-1 \end{pmatrix}$

$$\begin{pmatrix} 2 \\ 2 \\ 2 \end{pmatrix} \cdot \begin{pmatrix} x-1 \\ y-1 \\ z-1 \end{pmatrix} = 0$$

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

$$2x + 2y + 2z = 6$$

$x + y + z = 3$ is the equation of the tangent plane.

b) $F = 2z - x^2$ at the point $(2,0,2)$

$$\frac{\partial F}{\partial x} = -2x, \quad \frac{\partial F}{\partial z} = 2, \quad \frac{\partial F}{\partial y} = 0$$

at $(2,0,2)$, $\frac{\partial F}{\partial x} = -4$, $\frac{\partial F}{\partial y} = 0$, $\frac{\partial F}{\partial z} = 2$

Normal $= -4\underset{\sim}{i} + 2\underset{\sim}{k}$

Create vector around $\begin{pmatrix} 2 \\ 0 \\ 2 \end{pmatrix}$, we get $\begin{pmatrix} x-2 \\ y-0 \\ z-2 \end{pmatrix}$

Normal vector is $\begin{pmatrix} -4 \\ 0 \\ 2 \end{pmatrix}$

take dot product

$$\begin{pmatrix} -4 \\ 0 \\ 2 \end{pmatrix} \cdot \begin{pmatrix} x-2 \\ y-0 \\ z-2 \end{pmatrix} = 0$$

$$-4(x-2) + 2(z-2) = 0$$

$$-4x + 8 + 2z - 4 = 0$$

$-2x + z + 2 = 0$ is the equation of the tangent plane.