

3. Find the equation of the plane tangent to $x^2 + y^2 + 2z^2 = 7$ at $(1, 2, 1)$.

Gradients are $\perp$ to level sets

$\nabla \text{RHS}|_{p_t}$ is $\perp$ to the tangent plane

$(2x\vec{i} + 2y\vec{j} + 4z\vec{k})|_{(1,2,1)}$ is $\perp$ to the tangent plane

$2\vec{i} + 4\vec{j} + 4\vec{k}$ is $\perp$ to plane

$(1, 2, 1)$ is on the plane

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



4. Find the equations of the line perpendicular to $x^2 + y^2 + 2z^2 = 7$ at $(1, 2, 1)$.

We want the line through $(1, 2, 1)$ which is $\parallel$ to $2\vec{i} + 4\vec{j} + 4\vec{k}$

(The numbers have not changed since Problem 3.)

$$\begin{cases} X = 2t + 1 \\ Y = 4t + 2 \\ Z = 4t + 1 \end{cases}$$