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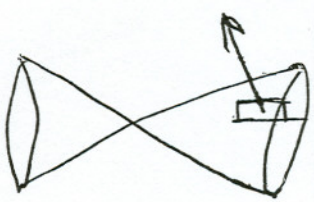
5. Find the equation of the **plane tangent** to $z^2 = x^2 + y^2$ at $(3, 4, 5)$.

Gradients are $\perp$ to level sets. View the surface as $0 = x^2 + y^2 - z^2$

$\vec{\nabla}(RHS)\big|_{(3,4,5)}$ is $\perp$ to the tang. plane

$(2x\vec{i} + 2y\vec{j} - 2z\vec{k})\big|_{(3,4,5)} = 6\vec{i} + 8\vec{j} - 10\vec{k}$

The tang. plane is $6(x-3) + 8(y-4) - 10(z-5) = 0$



6. Find the equation of the **line perpendicular** to $z^2 = x^2 + y^2$ at $(3, 4, 5)$.

Use the gradient from #5 the line through $(3, 4, 5)$ and parallel to $6\vec{i} + 8\vec{j} - 10\vec{k}$ is

$$\frac{x-3}{6} = \frac{y-4}{8} = \frac{z-5}{-10}$$