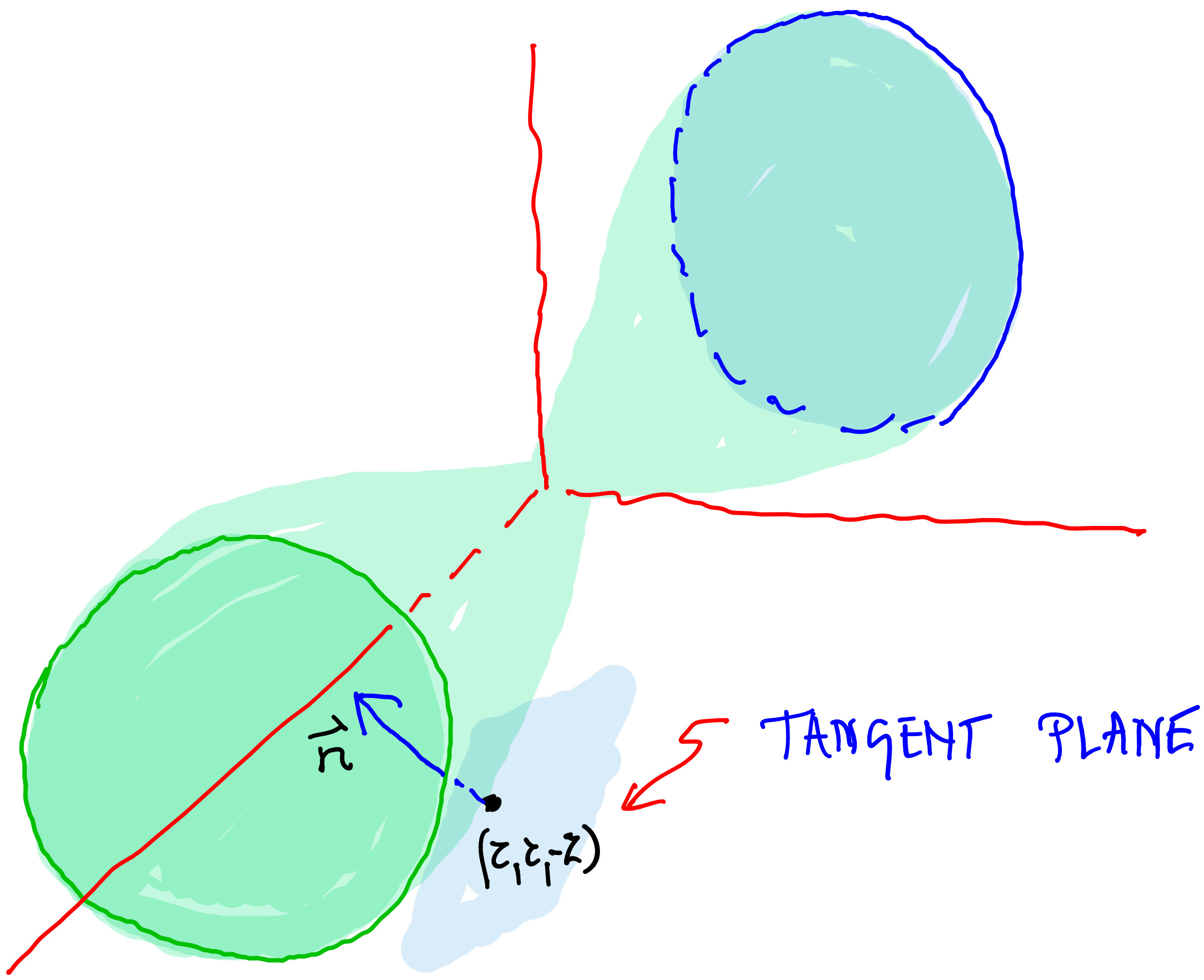
3.) $F(x,y,z) = 2x^2 - y^2 - z^2 = 0$

$$x = \pm \frac{1}{\sqrt{2}}\sqrt{y^2+z^2}$$



$$\nabla F = (4x, -2y, -2z)$$

$$\vec{n} = \nabla F\big|_{(2,2,-2)} = (8, -4, 4) = 4(2,-1,1)$$

TANGENT PLANE: $8(x-2) - 4(y-2) + 4(z+2) = 0$

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

NORMAL LINE:

$$(x,y,z) = (2,2,-2) + \lambda \vec{n} = (2,2,-2) + 4\lambda(2,-1,1)$$

$$= (2,2,-2) + \mu(2,-1,1) = (2(1+\mu), 2-\mu, -2+\mu)$$

AT $(0,0,0)$ THE SURFACE HAS A CORNER, SO NO TANGENT PLANE OR NORMAL LINE.

4.) $\cos(xz - y^2) \approx 1 - \frac{1}{2}(xz-y^2)^2 + \frac{1}{4!}\underbrace{(xz-y^2)^4}_{O((x^2+y^2+z^2)^4)} -$

$$- \underbrace{\frac{1}{6!}(xz-y^2)^6}_{O((x^2+y^2+z^2)^6)} + \cdots$$

— NEGLECTED

$$\approx 1 - \frac{1}{2}(xz-y^2)^2 + \frac{1}{4!}(xz-y^2)^4 + O((x^2+y^2+z^2)^6)$$

THE FIRST NEGLECTED TERMS ARE OF $O((x^2+y^2+z^2)^6)$