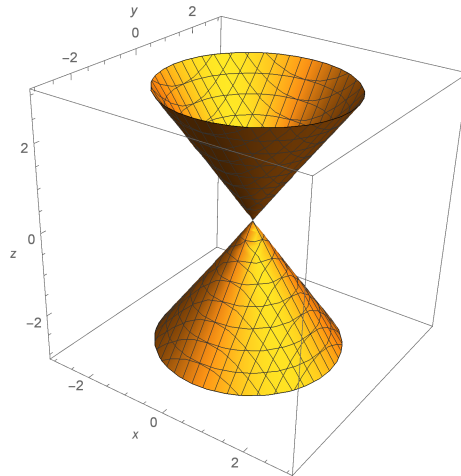


Name: _____

Problem 1. Consider the surface $2x^2 + 2y^2 - z^2 = 0$, which is a cone:



Find an equation for the tangent plane to the surface at the point $(x, y, z) = (1, 1, 2)$.

The normal vector to the tangent plane is given by the gradient vector at the point:

$$\begin{aligned}\nabla f &= \langle 4x, 4y, -2z \rangle \\ \nabla f(1, 1, 2) &= \langle 4, 4, -4 \rangle.\end{aligned}$$

The plane goes through the point $(1, 1, 2)$, and so our equation for a plane works out to

$$\begin{aligned}4(x - 1) + 4(y - 1) - 4(z - 2) &= 0, \\ 4x + 4y - 4z &= 0.\end{aligned}$$