

MATB42: Assignment #7

1. (a) Find an equation of the tangent plane to the surface S defined parametrically by $\Phi(u, v) = (u^2 + v, v, u + v^2)$ at the point $(9, 0, 3)$.

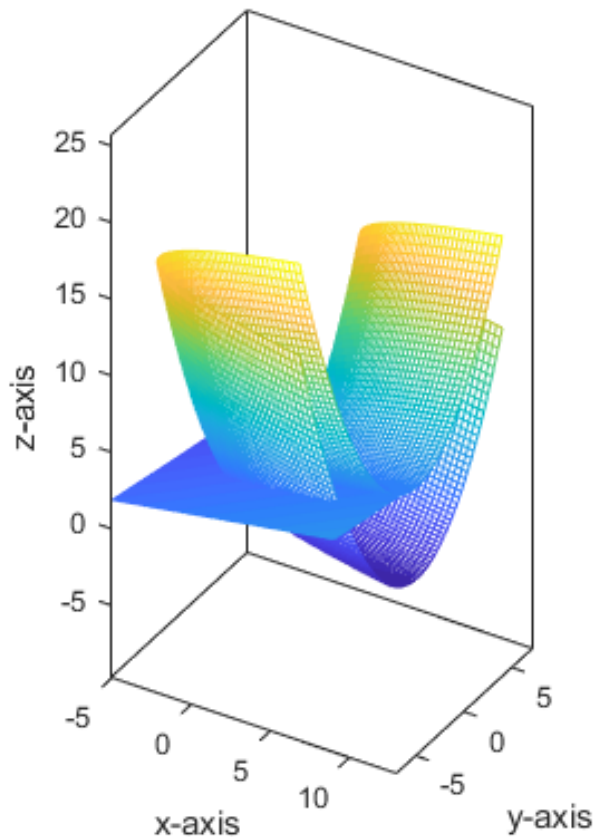
$$v = 0 \qquad u + v^2 = 3 \implies u = 3$$

$$\begin{aligned}\phi_u &= (2(3), 0, 1) \\ \phi_v &= (1, 1, 2(0)) \\ \phi_u \times \phi_v &= (-1, 1, 6)\end{aligned}$$

So the tangent plane can be given by

$$\begin{aligned}0 &= ((x - 9, y, z - 3) \cdot (-1, 1, 6)) \\ 0 &= (9 - x + y + 6z - 18) \\ 9 &= -x + y + 6z\end{aligned}$$

- (b) Use symbolic algebra software to sketch the surface S and its tangent plane from part (a).



2. Use a surface integral to find the area of the triangle in \mathbb{R}^3 with vertices $(1, 1, 0)$, $(1, 2, 1)$ and $(3, 3, 2)$.
3. Calculate the surface area of the piece of the cone $x^2 + y^2 - z^2 = 0$ which lies outside the cylinder $x^2 + y^2 = 4$.