

Problem statement a) If $f(x, y, z) = x^2 + y^2$, compute $\nabla f(x, y, z)$. What are $f(2, 1, 2)$ and $\nabla f(2, 1, 2)$?

b) If $g(x, y, z) = x^2 + y^2 + z^2 - xy - yz$, compute $\nabla g(x, y, z)$. What are $g(2, 1, 2)$ and $\nabla g(2, 1, 2)$?

c) The point $(2, 1, 2)$ is on both the surface $x^2 + y^2 = 5$, a circular cylinder whose axis of symmetry is the z -axis, and the surface $x^2 + y^2 + z^2 - xy - yz = 5$, an ellipsoid tilted with respect to the coordinate axes. The surfaces intersect in a curve. The surfaces and the curve are shown in the picture to the right. Find a vector tangent to that curve at $(2, 1, 2)$. The answers to a) and b) can be used here.

