(1) Let S be the paraboloid $z = 2x^2 + y^2$. Consider the parameterization of S given by $\phi(x, y) = (x, y, 2x^2 + y^2)$. Let $\vec{\mathbf{N}} = (n_1, n_2, n_3)$ be the unit normal vector field on S with $n_3 > 0$.

(a) Find the Christoffel symbols, the first and the second fundamental forms of S with respect to ϕ and $\vec{\mathbf{N}}$.

(b) Let $p = (1, 1, 3)$.
    Find $K(p)$.