Question: Find the values of x, y, z that maximize $3x + 5y + z - x^2 - y^2 - z^2$, subject to the constraint $6 - x - y - z = 0$.

First, write the objective function as $F(x, y, z) = 3x + 5y + z - x^2 - y^2 - z^2$ and the constraint as $G(x, y, z) = 6 - x - y - z$.

Then form the Lagrangian $L(x, y, z, \lambda) = F(x, y, z) + \lambda G(x, y, z) = 3x + 5y + z - x^2 - y^2 - z^2 + \lambda(6 - x - y - z)$.

Next, set $L_x = 0, L_y = 0, L_z = 0, L_\lambda = 0$ and solve this simultaneous system for x, y, z, λ.

By eliminating λ in the equations $L_x = 0, L_y = 0$, we get that $3 - 2x = 5 - 2y \implies y = 1 + x$.

By eliminating λ in the equations $L_x = 0, L_z = 0$, we get that $3 - 2x = 1 - 2z \implies z = x - 1$.

Substituting these into the equation $L_\lambda = 0$, we get $6 - x - (1 + x) - (x - 1) = 0 \implies 6 - 3x = 0 \implies x = 2$.

So, we get $x = 2, y = 3, z = 1$.