Problem 3a)

We can rewrite the equation as

$$z = (z_0 + a x_0^2 + a y_0^2) - a x_0 x - a y_0 y + a(x^2 + y^2)$$

Giving

$p_0 = z_0 + a x_0^2 + a y_0^2$

$p_1 = -a x_0$

$p_2 = -a y_0$

$p_3 = a$

This is the form we solve our equation in, but we can convert back to the given constants

$a = p_3$

$x_0 = -p_1/p_3$

$y_0 = -p_2/p_3$

$z_0 = p_0 - p_1^2/p_3 - p_2^2/p_3$