3. Suppose that $g(x,y) = f(x^2 - y^2, 2xy)$ where $f(x,y)$ is a differentiable function. Find an equation of the tangent plane to the graph of $z = f(x,y)$ at the point $(3,-4,7)$ if an equation of the tangent plane to the graph of $z = g(x,y)$ at the point $(-2,1,7)$ is $z = 5x - 6y + 23$.

$g_x(-2,1) = 5$ and $g_y(-2,1) = -6$

$g_x(x,y) = f_x(x^2-y^2, 2xy) \cdot 2x + f_y(x^2-y^2, 2xy) \cdot 2y$

$g_y(x,y) = f_x(x^2-y^2, 2xy) \cdot (-2y) + f_y(x^2-y^2, 2xy) \cdot 2x$

$5 = f_x(3,-4) \cdot (-4) + f_y(3,-4) \cdot 2$

$-6 = f_x(3,-4) \cdot (-2) + f_y(3,-4) \cdot (-4)$

$f_x(3,-4) = -\frac{2}{5}$ and $f_y(3,-4) = \frac{17}{10}$

An equation for the tangent plane to the graph of $z = f(x,y)$ at the point $(3,-4,7)$ is:

$$z = -\frac{2}{5} \cdot (x-3) + \frac{17}{10} \cdot (y-(-4)) + 7$$

[Make sure that your solution works for ***any*** f satisfying the given conditions as showing that they uniquely determine the answer is also part of the solution.]