Lagrange multiplier quiz

Suppose \( g(x, y) = 3x^3 + 4y^3 \) and let \( f(x, y) = x^2 + y^2 \). 

1. Find \( \nabla f \) and \( \nabla g \).

2. Find the points on the level curve \( g(x, y) = 12 \) which satisfy the equation 
\[
\nabla g = \lambda \nabla f
\]
for some nonzero \( \lambda \), and calculate \( f \) in those cases.

[Don’t bother to calculate \( \lambda \) unless you have to. HINT: \( 18^2 = 324 \), \( 18^3 = 5832 \).]