1. (3 points) Find the equation of the tangent plane for $z = \sqrt{xy}$ at the given point $(1, 1, 1)$.

2. (3 points) Suppose $f(x, y)$ is differentiable function with $f(1, 1) = 4$, $f_x(1, 1) = -1$ and $f_y(1, 1) = 3$. Use the linear approximation to estimate $f(0.9, 1.2)$. 
3. (4 points) Let \( z = \int_x^y \sec^3 s \, ds \) when \( x = 3t^2 \) and \( y = \sqrt{t} \). Find \( \frac{dz}{dt} \).