1. If \( z^3 = x^2 + y \), find \( dz/dt \) when \( x = 2, y = 4, dx/dt = 1 \) and \( dy/dt = 2 \).

Differentiate to get \( 3z^2 (dz/dt) = 2x(dx/dt) + dy/dt \). Now, \( z^3 = 2^2 + 4 = 8 \), so \( z = 2 \), and \( 12 dz/dt = 4 \cdot 1 + 2 = 6 \). Hence \( dz/dt = 1/2 \).

2. Use a linear approximation or differentials to approximate the number \( \sqrt{99.4} \).

Take \( f(x) = \sqrt{x} \), \( f'(x) = 1/(2\sqrt{x}) \). If \( x = 100, dx = -.6 \), then \( f(x) = 10, df = (1/20)dx = -.03 \). Hence \( \sqrt{99.4} \approx 9.97 \) (a calculator gives 9.969955\ldots).