1. Consider the function 
\[ f(x) = x + \sqrt{x^2 + 1}, \quad -\infty < x < \infty. \]

(i) (10 marks) Show that \( f \) is one-to-one.

(ii) (10 marks) Find the real number \( x_0 \) such that \( f(x_0) = 3 \) (in other words, solve the equation \( x + \sqrt{x^2 + 1} = 3 \) to find its unique solution \( x_0 \)).

(iii) (10 marks) Let \( f^{-1} \) denote the inverse of \( f \). Use the Differentiation Theorem for Inverse Functions to compute \( (f^{-1})'(3) \).

(iv) (10 marks) Obtain the linear approximation to \( f^{-1} \) near the point 3.