1 General Function Stuff

Problem 1.1: Let \( f(x) = \sqrt{x} \) and \( g(x) = 4\sqrt{-3x+2} - 5 \).
   a) What are the domains of \( f \) and \( g \)?
   b) Sketch \( f \) and \( g \) on the same set of axes.

Problem 1.2: Calculate the following compositions.
   a) \( f \circ g \), where \( f(x) = ax + b \) and \( g(x) = cx + d \).
   b) \( g \circ f \), where \( f(x) = ax + b \) and \( g(x) = cx + d \).
   c) \( f \circ g \), where \( f(x) = x^2 - 1 \) and \( g(x) = x^2 + 1 \)

Problem 1.3: Find the inverses of the following functions.
   a) \( \frac{4x-1}{2x+3} \)
   b) \( x^2 - x \)

Problem 1.4: If \( f(x) = x^3 + x + 1 \), find \( f^{-1}(3) \) and \( f(f^{-1}(2)) \).

Problem 1.5: Show that \( \cos(\sin^{-1}(x)) = \sqrt{1-x^2} \).

Problem 1.6*: On one set of axes draw 10 different functions which satisfy the equation \( f(f(x)) = x \) and have domain \((0,\infty)\).

2 Exponentials and Logarithms

Problem 3.1: Prove the following rules of logarithms. You can assume facts about exponentials.
   a) \( \log(x) + \log(y) = \log(xy) \)
   b) \( \log_a(x) = \frac{\log(x)}{\log(a)} \)

Problem 3.2: Solve for \( x \):
   a) \( 2^x = 10^3 \)
   b) \( \log(\log(x)) = 1 \)
   c) \( e^{ax} = Ce^{bx} \), where \( a \neq b \) and \( C > 0 \)