

Calculus 1 Assignment 2

Alex Cowan
cowan@math.columbia.edu

Due Tuesday February 5th at 2:40 pm

1 General Function Stuff

Problem 1.1: Let $f(x) = \sqrt{x}$ and $g(x) = 4\sqrt{-3x+2} - 5$.

- What are the domains of f and g ?
- Sketch f and g on the same set of axes.

Problem 1.2: Calculate the following compositions.

- $f \circ g$, where $f(x) = ax + b$ and $g(x) = cx + d$.
- $g \circ f$, where $f(x) = ax + b$ and $g(x) = cx + d$.
- $f \circ g$, where $f(x) = x^2 - 1$ and $g(x) = x^2 + 1$

Problem 1.3: Find the inverses of the following functions.

- $\frac{4x-1}{2x+3}$
- $x^2 - x$

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.

- $\log(x) + \log(y) = \log(xy)$
- $\log_a(x) = \frac{\log(x)}{\log(a)}$

Problem 3.2: Solve for x :

- $2^x = 10^3$
- $\log(\log(x)) = 1$
- $e^{ax} = Ce^{bx}$, where $a \neq b$ and $C > 0$