Exercise # 1
Let \( f : \mathbb{R} \to \mathbb{R}, f(x) = \frac{3x-4}{x-1} \). Is \( f \) one-to-one? Is \( f \) onto?

Exercise # 2
Let \( f : \mathbb{N} \to \mathbb{N}, f(n) = n + 1 \),
\[ g : \mathbb{N} \to \mathbb{N}, g(n) = \begin{cases} 0 & \text{if } n = 0, \\ n - 1 & \text{if } n \geq 1. \end{cases} \]
Are \( f \) and \( g \) inverses of each other? Explain!

Exercise # 3
Determine whether \( f : \mathbb{Q} \times \mathbb{Q} \to \mathbb{Q} \), given by
\[ f\left(\frac{a}{b}, \frac{c}{d}\right) = \frac{a + c}{b + d} \]
is a function.

Exercise # 4
For \( f : X \to Y \), and \( W \subseteq Y \), define \( f^{-1}(W) = \{ x \in X : f(x) \in W \} \). Let \( f : \mathbb{R} \to S^1 \), where \( S^1 = \{ z \in \mathbb{C} : |z| = 1 \} \) is the unit circle, \( f(x) = e^{2\pi i x} \) (where \( i = \sqrt{-1} \)). What is \( f^{-1}(\{1\}) \)?

Exercise # 5
We consider functions \( f_i : (0,1) \to (0,1) \). Let
\[ f_1(x) = 1/x, \quad f_2(x) = 1 - x. \]

a) What is \( f_3 = f_1 \circ f_2 \)?
b) What is \( f_4 = f_2 \circ f_1 \)?
c) What is \( f_5 = f_1 \circ f_4 \)?
d) Let \( f_0(x) = x \). For \( i = 0, 1, \ldots, 5 \) and \( j = 0, 1, \ldots, 5 \), compute \( f_i \circ f_j \). Make a table, the \((i,j)\)-th entry of which is \( k \) where \( f_i \circ f_j = f_k \).

due to Friday, August 30.