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CSE 150 - Foundations of Computer Science: Honors
Professor Bender

<u>Homework 2B</u>

<u>Problem 5</u>
Show that the function $f : \mathbb{N} \to \mathbb{N}$ has the listed properties:

1. $f(x) = 2x$ (one-to-one but not onto)
   <u>Response</u>

2. $f(x) = x + 1$ (one-to-one but not onto)
   <u>Response</u>

3. $f(x) = $ if x is odd then x - 1, lse $x + 1$ (bijective)
   <u>Response</u>

<u>Problem 6</u>
Show that the product $(a + bi)(c + di)$ of two complex numbers can be evaluated using just three real-number multiplications. You may use a few extra additions
<u>Response</u>

<u>Problem 7</u>
Given a fixed function $f : A \to A$. An element $a \in A$ is called a $fixedpoint$ of f if $f(a) = a$. Find the set of fixed points for each of the following functions.

1. $f : A \to A$ where $f(x) = x$
   <u>Response</u>

2. $f : \mathbb{N} \to \mathbb{N}$ where $f(x) = x + 1$
   <u>Response</u>

3. $f : \mathbb{N}_6 \to \mathbb{N}_6$ where $f(x) = 2x$ mod 6
   <u>Response</u>

4. $f : \mathbb{N}_6 \to \mathbb{N}_6$ where $f(x) = 3x$ mod 6
   <u>Response</u>

<u>Problem 8</u>
Let $f(x) = x^2$ and $g(x, y_=x + y$. Find compositions that use the functions f and g for each of the following expressions.

1. $(x + y)^2$

   <u>Response</u>

2. $x^2 + y^2$

   <u>Response</u>

3. $(x + y + z)^2$

   <u>Response</u>

4. $x^2 + y^2 + z^2$

   <u>Response</u>