One of the problems below will be chosen at random in class for a quiz.

1. Give a recursive algorithm for finding the maximum number from a finite set of integers.

2. Let $x$ be a real number. Consider the program

$$
\begin{align*}
\text{if } x < 0 \\
x &= 0
\end{align*}
$$

Prove that after this code is executed $x \geq 0$ is true.

3. Give a recursive algorithm for finding the string $w^i$, the concatenation of $i$ copies of $w$, when $w$ is a bit string.

4. Determine whether each of these functions is a bijection from $\mathbb{R}$ to $\mathbb{R}$.
   
   (a) $f(x) = -3x + 4$
   
   (b) $f(x) = -3x^2 + 7$
   
   (c) $f(x) = (x + 1)/(x + 2)$
   
   (d) $f(x) = x^5 + 1$

5. (a) Prove that a strictly increasing function from the set of real numbers to itself is one-to-one.

   (b) Give an example of an increasing function from the set of real numbers to itself that is not one-to-one.

6. Show that $(w^R)^i = (w^i)^R$ whenever $w$ is a string and $i$ is a nonnegative integer; that is, show that the $i$th power of the reversal of a string is the reversal of the $i$th power of the string.