CSIT504 Module 3 Homework

1. (Problem 1 on page 152 from Rosen) Why is f not a function from $\Re$ to $\Re$ if
   - $f(x) = 1/x$?
   - $f(x) = \sqrt{x}$?
   - $f(x) = \pm\sqrt{x^2+1}$?
2. (Problem 9 on page 153 from Rosen) Find these values.
   - $\lceil 3/4 \rceil$.
   - $\lfloor 7/8 \rfloor$.
   - $\lceil -3/4 \rceil$.
   - $\lfloor -7/8 \rfloor$.
   - $\lceil 3 \rceil$.
   - $\lfloor -1 \rfloor$.
   - $\lfloor 1/2 + \lceil 3/2 \rceil \rfloor$.
   - $\lfloor 1/2 \lfloor 3/2 \rfloor \rfloor$.
3. (Problem 21 on page 153 from Rosen) Give an explicit formula for a function from the set of integers to the set of positive integers that is
   - one-to-one but not onto.
   - onto, but one-to-one.
   - one-to-one and onto.
   - neither one-to-one nor onto.
4. (Problem 23 on page 153 from Rosen) Determine whether each of the following is a bijection from $\Re$ to $\Re$.
   - $f(x) = 2x + 1$.
   - $f(x) = x^2 + 1$.
   - $f(x) = x^3$.
   - $f(x) = (x^2+1)/(x^2+2)$.
5. (Problem 35 on page 154 from Rosen) If f and $f \circ g$ are onto, does it follow that g is onto? Justify your answer.
6. (Problem 3 on page 167 from Rosen) What are the terms a_0, a_1, a_2, and a_3 of the sequence $\{a_n\}$, where a_n equals
   - $2^n + 1$?
   - $(n+1)^{n+1}$?

- $\lfloor n/2 \rfloor$?
- $\lfloor n/2 \rfloor + \lceil n/2 \rceil$?

7. (Problem 29 on page 169 from Rosen) What are the values of these sums?
   - $\sum_{k=1}^{5}(k+1)$
   - $\sum_{k=0}^{4}(-2)^k$
   - $\sum_{k=1}^{10} 3$
   - $\sum_{k=0}^{8}(2^{k+1} - 2^k)$

8. (Problem 3 on page 176 from Rosen) Determine whether each of these sets is countable or uncountable. For those that are countably infinite, exhibit a one-to-one correspondence between the set of positive integers and that set.
   - all bit strings not containing the bit 0.
   - all positive rational numbers that cannot be written with denominators less than 4.
   - the real numbers not containing 0 in their decimal representation.
   - the real numbers containing only a finite number of 1s in their decimal representation.