MATH213   HW 2

due **Feb 8** before class

1: Find the domain and range of these functions.
a) the function that assigns to each real number its square;
b) the function that assigns to each positive real number the square root of it;
c) the function that assigns to each bit string the difference between the number of zero bits and the number of one bits in this string;
d) the function that assigns to each pair of positive integers their sum.

2: Give an explicit formula for a function from the set of positive integers to the set of non-negative integers that is
a) one-to-one, but not onto;
b) onto, but not one-to-one;
c) neither onto nor one-to-one;
d) both one-to-one and onto.

3: Let $f(x) = 2x + 1$, $g(x) = x^2 - 2$, and $h(x) = x - 10$. Find
a) $f \circ g \circ h$,
b) $h \circ g \circ f$,
c) $h \circ g \circ f \circ h$.

4: Draw the graphs of these functions.
a) $f_1(x) = \lfloor x + \frac{1}{2} \rfloor - 1$;
b) $f_2(x) = \lfloor x - \frac{1}{3} \rfloor + \lceil x + \frac{1}{3} \rceil$;
c) $f_3(x) = \lfloor 0.5 \lceil 2x/3 \rceil + 0.5 \rfloor$.

5: If we have pennies, dimes, quarters and dollars, but no nickels, does the greedy algorithm always produce change using the fewest coins possible? If *yes*, give a proof, if *no*, present a counterexample.