

CISC-102 WINTER 2017

HOMEWORK 4

Please work on these problems and be prepared to share your solutions with classmates in class next week. Assignments will **not** be collected for grading.

READINGS

Read sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, (in 3.3 you may skip the part on permutations) of *Schaum's Outline of Discrete Mathematics*.

Read section 2.1 again (If you did not understand things last week) of *Discrete Mathematics Elementary and Beyond*.

PROBLEMS

- (1) Determine whether the mappings from \mathbb{R} to \mathbb{R} shown below are or are not functions, and explain your decision.
 - (a) $f(x) = 1/x$
 - (b) $f(x) = \sqrt{x}$
 - (c) $f(x) = 3x - 3$
- (2) Determine whether each of the following functions from \mathbb{R} to \mathbb{R} is a bijection, and explain your decision. HINT: Plotting these functions may help you with your decision.
 - (a) $f(x) = 3x + 4$
 - (b) $f(x) = -x^2 + 2$
 - (c) $f(x) = x^3 - x^2$
- (3) Consider the recursive function $T(1) = 1, T(n) = T(n - 1) + 1$, for all $n \geq 2$.
 - (a) Use the recursive definition to obtain values $T(2)$, $T(3)$, and $T(4)$.
 - (b) Use the values that you obtained for $T(2)$, $T(3)$, and $T(4)$, to guess the value of $T(n)$, and then prove that it is correct using induction.
- (4) Consider the recursive function $F(1) = 3, T(n) = 3F(n - 1)$, for all $n \geq 2$.
 - (a) Use the recursive definition to obtain values $F(2)$, $F(3)$, and $F(4)$.
 - (b) Use the values that you obtained for $F(2)$, $F(3)$, and $F(4)$, to guess the value of $F(n)$, and then prove that it is correct using induction.