

## CISC-102 FALL 2018

### HOMEWORK 4

Please work on these problems and be prepared for solutions in class next Thursday. Assignments will not be collected for grading.

Read sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, (in 3.2 you may skip the part on composition and 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*.

- (1) Determine whether the mappings given below where  $f : \mathbb{R} \mapsto \mathbb{R}$  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) Using 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  $F(1) = 3, F(n) = 3F(n - 1)$ , 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.