UNIVERSITY of GUELPH

CIS1910 Discrete Structures in Computing (I)
Winter 2019, Lab 2 Notes

Here are recommended practice exercises. Many have been covered in Lab 2.

A. INEQUALITIES

1. Let a, b and c be real numbers. Complete and make it come true.

$\sqrt{a} \le \sqrt{b}$ iff $a \le b$ …… (41)

$a^2 \le b$ iff $a \le \sqrt{b}$ …… (42)
$a^2 \ge b$ iff $a \ge \sqrt{b}$ …… (43)
$\sqrt{a} \le b$ iff $a \le b^2$ …… (44)
$\sqrt{a} \ge b$ iff $a \ge b^2$ …… (45)

$a \le b$ iff $a+c \le b+c$ …… (46)
($a \le b$ ……) iff ($ac \le bc$ ……) (47)
($a \le b$ ……) iff ($ac \ge bc$ ……) (48)

2. ***Solve over*** $\mathbb{R}$ the following inequalities in x, i.e., for each inequality, find the set of all the elements x of $\mathbb{R}$ such that the inequality holds (this set is called the ***solution set***).

2.1. $1-2x \le 3$

2.2. $\sqrt{4x+3} \le \sqrt{7x+9}$

2.3. $(x+2)^2 \le 9$

2.4. $\sqrt{3x+7} \ge x+1$ (*hint:* $(x-3)(x+2)=x^2-x-6$)

B. FUNCTIONS

1. What are all the functions from {x,y} to {0,1}? Write each function as a triple and represent it by an arrow diagram; specify the domain, codomain, domain of definition, range and graph.

2. Consider the function $f : U \to V$, $x \mapsto \sqrt{2x+1}$ where U and V are two subsets of $\mathbb{R}$.

2.1. What is the domain of definition of f if U=$\mathbb{R}$ and V=$\mathbb{R}$?

2.2. What is the domain of definition of f if U=[−1,1] and V=$\mathbb{R}$?

2.3. What is the domain of definition of f if U=$\mathbb{R}$ and V=[−1,1]?

3. Consider the function $f : [0,1] \to \mathbb{R}$, $x \mapsto (4x-3)^2$

3.1. Does −1 belong to the range of f? What about 1, 4, 16?

3.2. What is the range of f?

C. NUMERAL SYSTEMS

1. What are the base 10 expansions of $(10014)_{16}$, $(DF7)_{16}$ and $(9A5)_{11}$?

2. What are the base 10 expansions of $(21331)_4$, $(110110)_2$ and $(12021)_3$?

3. What is the base 4 expansion of 637?
What is the base 2 expansion of 100? What is its base 3 expansion?

4. Find the base 8 expansion of $(11110)_2$ and the base 16 expansion of $(11110)_2$.

5. Find the base 5 expansion of $(1A7)_{16}$ and the base 8 expansion of $(1A7)_{16}$.

6. Calculate the base 8 expansion of $(751)_8+(743)_8$ and the base 2 expansion of $(1110)_2\times(101)_2$.