MATH217E **Fall 2017**

Programming Assignment #2 **Due: November 8, 2017 Wednesday 23:59**

In this programming assignment, you will write a program that determine whether a function is one-to-one, onto or bijection.

A function *f* : *A* → *B* can also be defined in terms of a relation from *A* to *B*. A relation from *A* to *B* is just a subset of *A* × *B*. A relation from *A* to *B* that contains one, and only one, ordered pair *(a, b)* for every element *a* ∈ *A*, defines a function *f* from *A* to *B*. This function is defined by the assignment *f (a)* = *b*, where *(a, b)* is the unique ordered pair in the relation that has *a* as its first element.

Here, a function is specified by a relation R. You should use a 2-dimensional array to store a relation. In the programming assignment, you will implement the following methods:

- `boolean isOneToOne(int[][] relation)` determines whether the function is one-to-one.
- `boolean isOnto(int[][] relation)` determines whether the function is onto.
- `boolean bijection(int[][] relation)` determines whether the function is bijection.
- `int[][] inverse(int[][] relation)` finds the inverse of a *f*.

You must test your program with the following functions:

1. $f: [-2,2] \in \mathbb{Z} \to [-8,8] \in \mathbb{Z}, f(x) = x^3$
2. $f: [-2,2] \in \mathbb{Z} \to [-1,3] \in \mathbb{Z}, f(x) = x + 1$
3. $f: [-2,2] \in \mathbb{Z} \to [0,2] \in \mathbb{Z}, f(x) = |x|$

In the main function,

1. You must define the function in terms of a relation.
2. You must call the three methods and display the results.
    a. If the given function is bijection, then the program should find the inverse of this function and display it.

Submission Instructions

Please zip and submit all your files (report (.pdf) and java file) using filename YournumberHW2.zip (150713852HW2.zip) via Google Classroom. Report must contain the source code with comments and **screen shot of the output** that comes on console screen. Class name should consists of **your name and surname** like BernaKirazTest.java.

Notes:

1. Write a comment at the beginning of the program to explain the purpose of the program.
2. Write your name and student ID as a comment.
3. Include necessary comments to explain your actions.
4. Select meaningful names for your variables and class name.

Grading:

a. Methods (10 pt. each – 40 points)
b. Test functions (10 pt. each – 30 points)
c. Correct results (15 points)
d. Comments are necessary! (10 points)
e. Correct format (5 points)

Warning: All types of plagiarism will result in zero grade from the homework. No late submission will be accepted.