

## TP 3: Classes, operator overloading

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### 1 Classes

**1-1)** Recall the class (here named `R2`) representing points with two real coordinates of the previous TP 2. Write two functions (not methods...):

- a function returning the (euclidian) distance between two elements of `R2`,
- a function comparing two elements of `R2` and returning true if both coordinates coincide, and false otherwise.

**1-2)** Write a class named `matR2` representing  $2 \times 2$  matrices of real values. This class should be equipped with:

- Default constructor
- Copy constructor
- Constructor creating a matrix from 4 values
- A display method

In this class the entries of the matrices should be "private". Also write a function (not a method...) computing the determinant of a  $2 \times 2$  matrix, and another one that computes its trace.

**1-3)** In a new file not containing the classes previously written, write a main function where you test all the features that you have just implemented, so as to verify that there is no bug.

### 2 Operator overloading

**2-1)** In the class `R2` add the following operator overloading features:

- Assignment operator `=`
- Output stream operator `<<`

- Operator `+` for addition of two elements of `R2`
- Operator `*` for multiplying a real number by an element of `R2`
- Operator `,` for the scalar product of two elements of `R2`
- Operator `[ ]` for accessing the coordinates of elements of `R2`

The operator `[ ]` should make it possible to modify the coordinates of elements of `R2`.

**2-2)** In the class `matR2`, add the following operators:

- Assignment operator `=`
- Output stream operator `<<`
- Operator `+` for addition of two elements of `matR2`
- Operator `*` for multiplying two elements of `matR2`
- Operator `*` for multiplying an element of `matR2` by an element of `R2`
- Operator `( , )` taking two integers as input, and returning the corresponding entries of the matrix.

The operator `( , )` should make it possible to modify the coordinates of elements of `matR2`.

**2-3)** Modify your main function so as to test the new functionalities associated with the operators mentioned above.