

Programming. Write only code in the following. Do not write any comments.

#1. Design a Java CartesianPoint class for a Cartesian Point which **implements both cloneable and comparable interfaces**

The class should have the following private member variables:

- *the x value of a point: int*
- *the y value of a point: int*

and the class should have the following public member functions:

- default constructor which initializes the point to the origin of the Cartesian coordinate system
- explicit constructor which initializes the point to a pair of given value as ( $u$ ,  $v$ )
- `setX()` function, which sets the  $x$  value to a new value  $v$
- `setY()` function, which sets the  $y$  value to a new value  $u$
- `whereX()` function, which returns the  $x$  value
- `whereY()` function, which returns the  $y$  value
- Overridden `compareTo()` method: use the distance to the coordinate system's origin for comparison
- Overridden `clone()` method.

**Please write your complete CartesianPoint class and its testing class below**

1a (35 pts) Write your complete Java code for the above Java class in CartesianPoint.java file.

1b (35 pts) In a new file named testPoint.java, write your test Java class and its main method which will do the following:

- ✓ create two Cartesian objects(pointOne, pointTwo), both of them with the explicit constructors;
- ✓ then compare the two points and output the farther away one's  $x$  and  $y$  coordinates (test of comparable interface);
- ✓ next create a third CartesianPoint object pointThree which is a clone of the farther away one between the above two points, and then reset its coordinates to new  $x$  and  $y$  values and output them.

#2. (30 pts) In a JavaFX application there is a TextField control(tfRadius) for taking input of a sphere's radius. Please write the portions of codes which calculates the sphere's volume when the button(btCalculate) is clicked and the calculated volume is displayed on a TextArea control(trLabel). Assuming the codes for layout setup already completed and you are only required to complete the calculation part and handling of button click event.