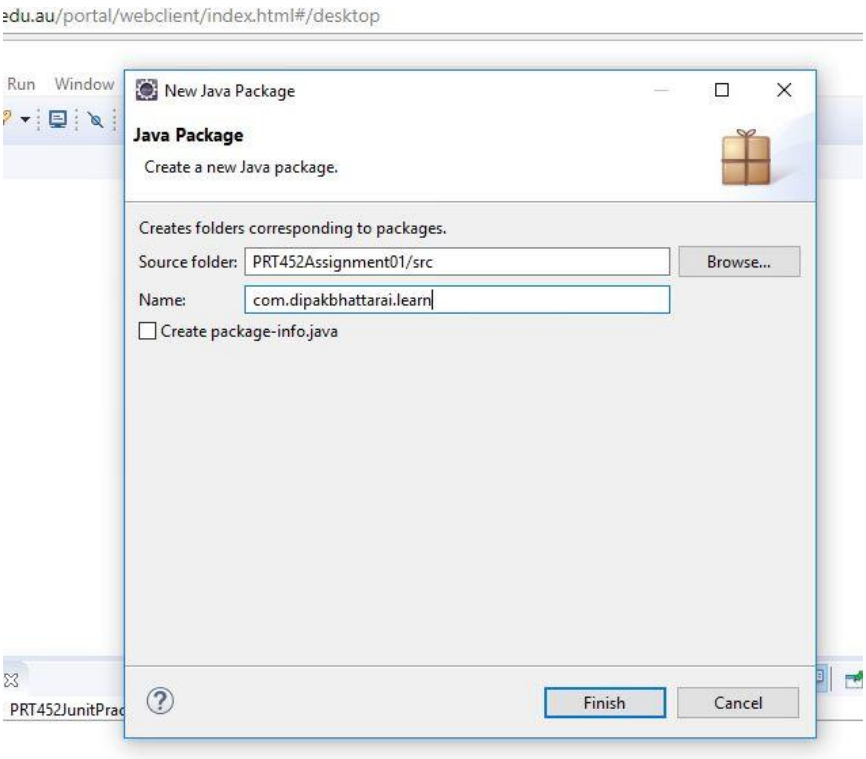
Part 1: Test Cases:

TDD Test Cases for gradient, distance and equation of line between two points:

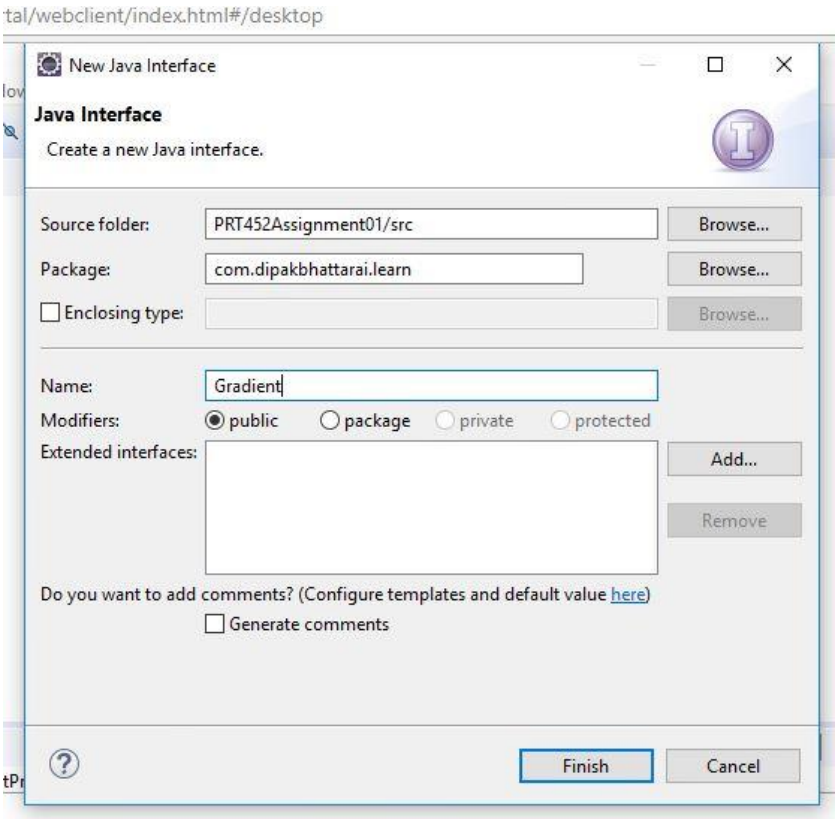
S.N	Test Case Description	Input				Expected Output			Remarks
		X1	**Y1**	**X2**	**Y2**	**Gradient (y2-y1)/ (x2-x1)**	**Distance $\sqrt{(x2-x1)^2 -(y2-y1)^2}$**	**Equation y-y1=m(x-x1) or y=mx +c**	
1	User enters the coordinates A(0,0), B(0,0)	0	0	0	0	0	0	0	
2	User enters the coordinates A(1,1), B(1,1)	1	1	1	1	unidentified	0	Y=0	
3	User enters the coordinates A(-2,1), B(-1,1)	-2	1	-1	1	1	0	Y=1	
4	User enters the coordinates A(4,3), B(6,7)	4	3	6	7	2	√20	Y=2x - 5	
6	User enters the coordinates A(0,0), B(0,0)	2	4	4	6	1	√8	y = x + 2	

Part 2: Program developing screenshots:

Step 1: The project PRT452Assignment01 has been created and the package com.dipakbhattarai.learn is created.

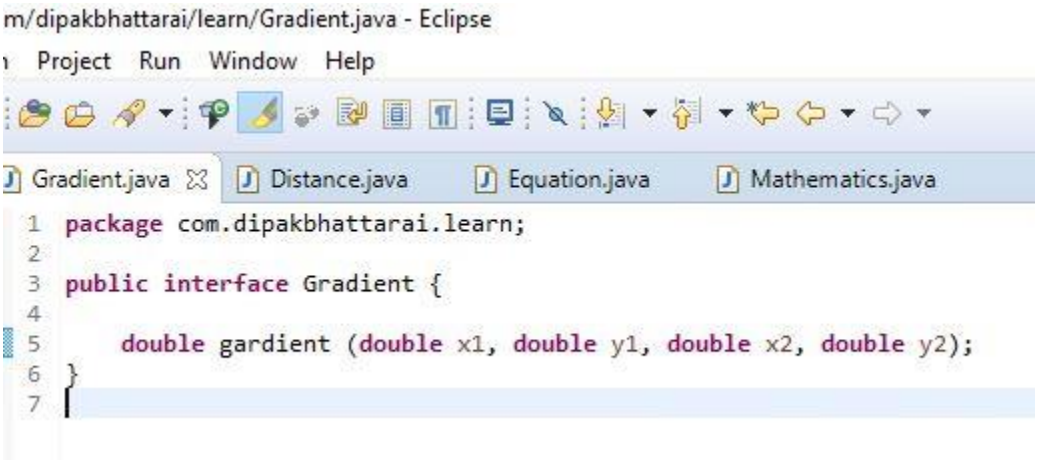


Step 2: The Interface Gradient is created. Similarly, the interfaces Distance and Equation are also created.

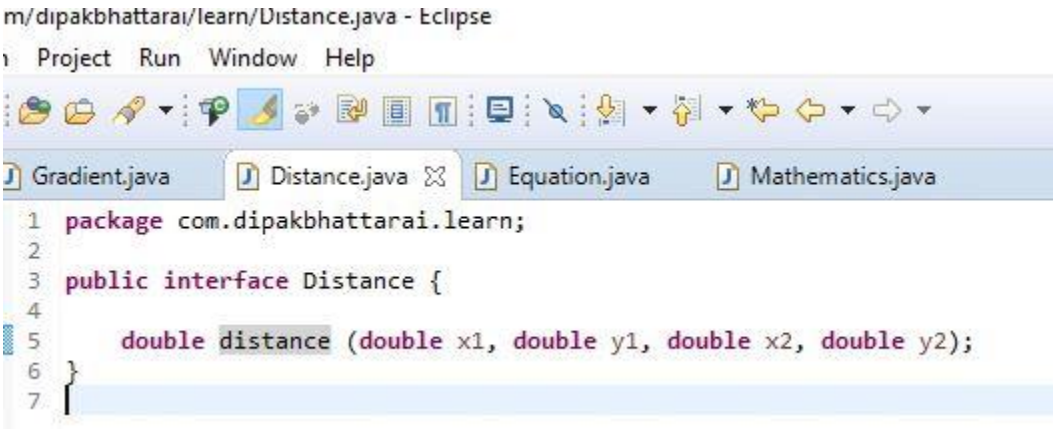


Step 3: The interfaces are created with the methods with their respective parameters.

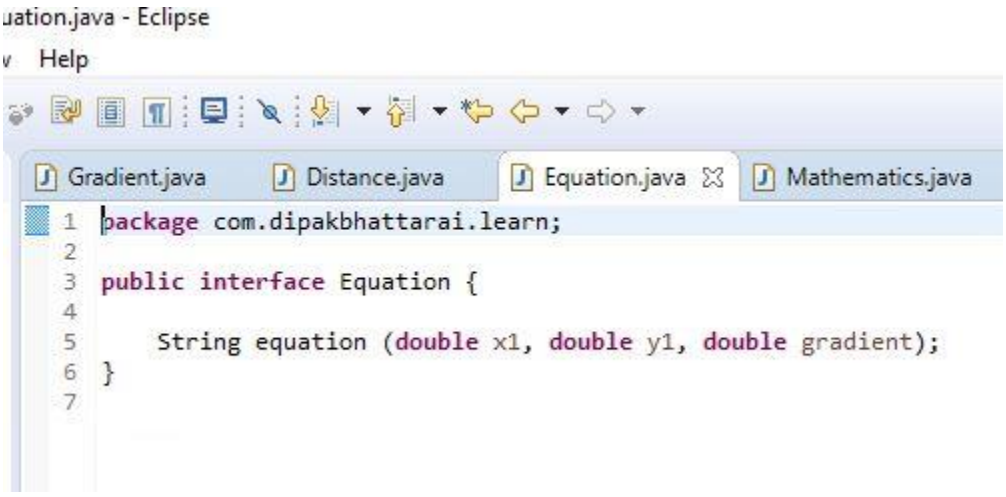
Interface1: Gradient and its method with parameters.



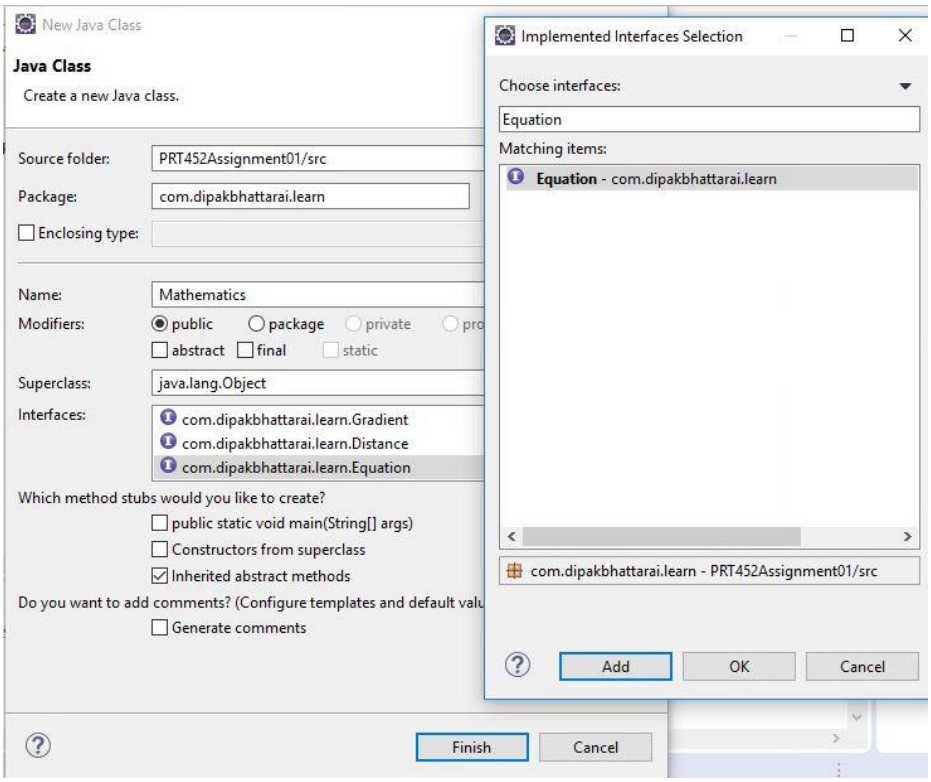
Interface2: Distance and its method with parameters.



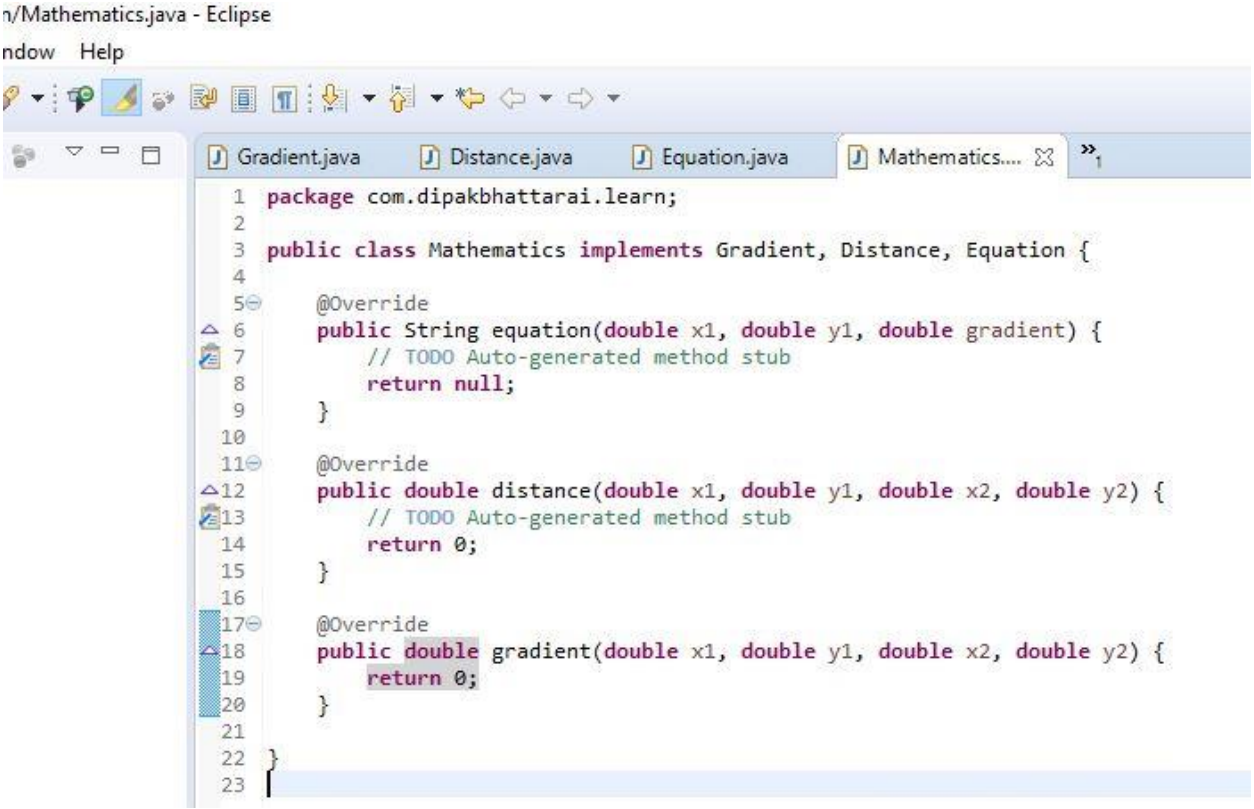
Interface3: Equation and its method with parameters.



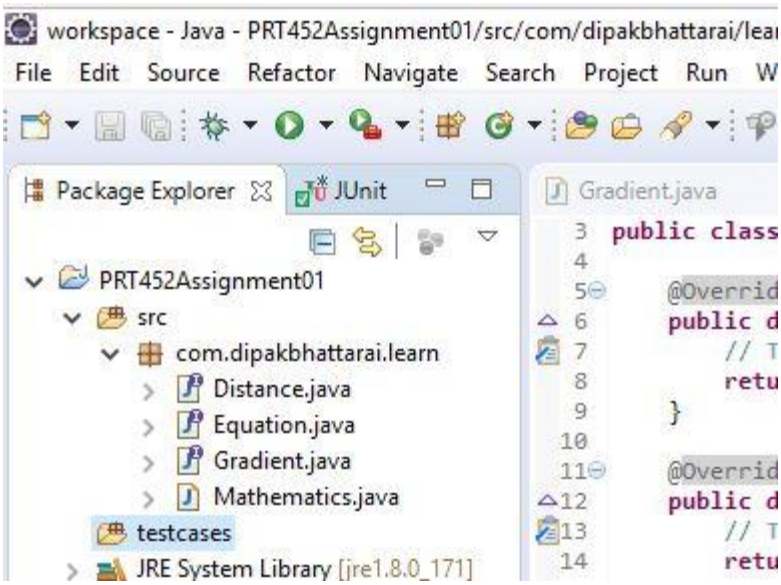
Steps 4: The java file "Mathematics.java" is created and the three interfaces are also implemented as shown in the picture:



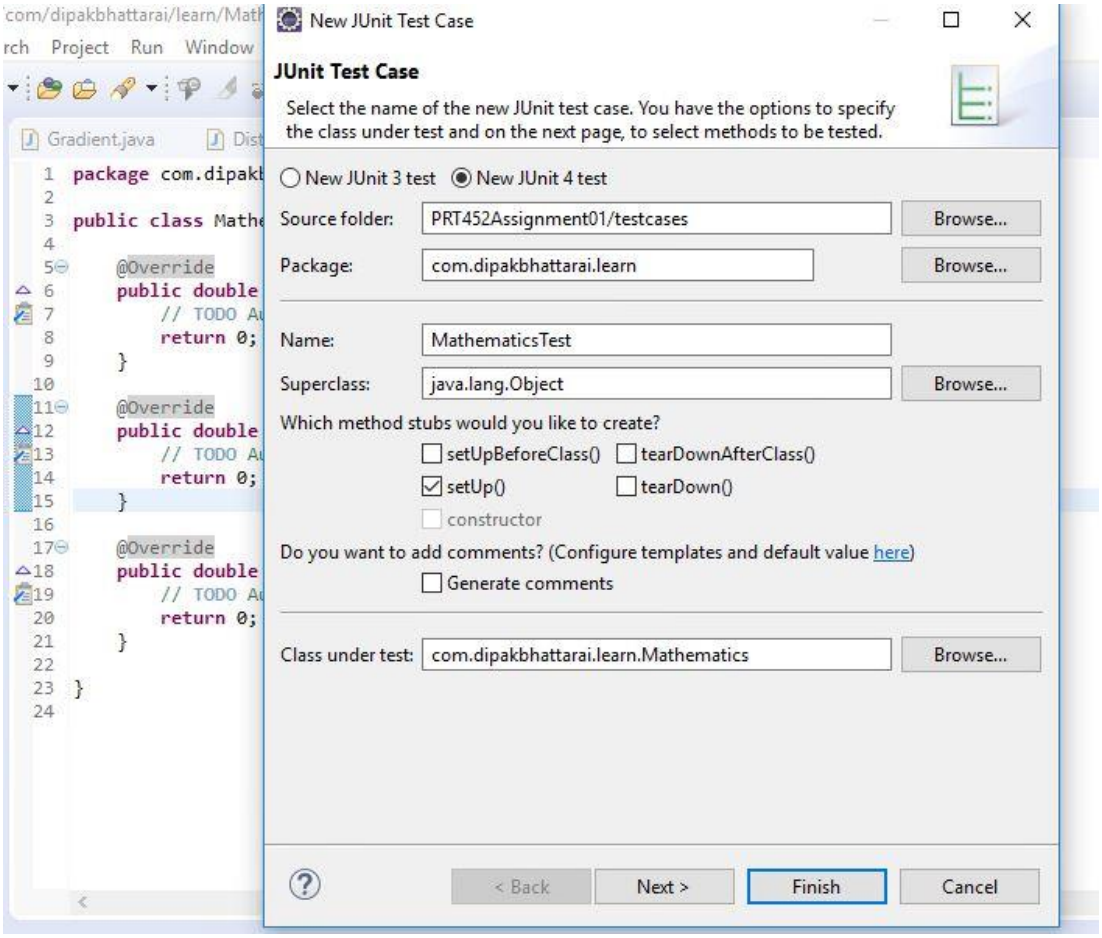
Output: The class Mathematics.java is created with its methods implemented from the interfaces



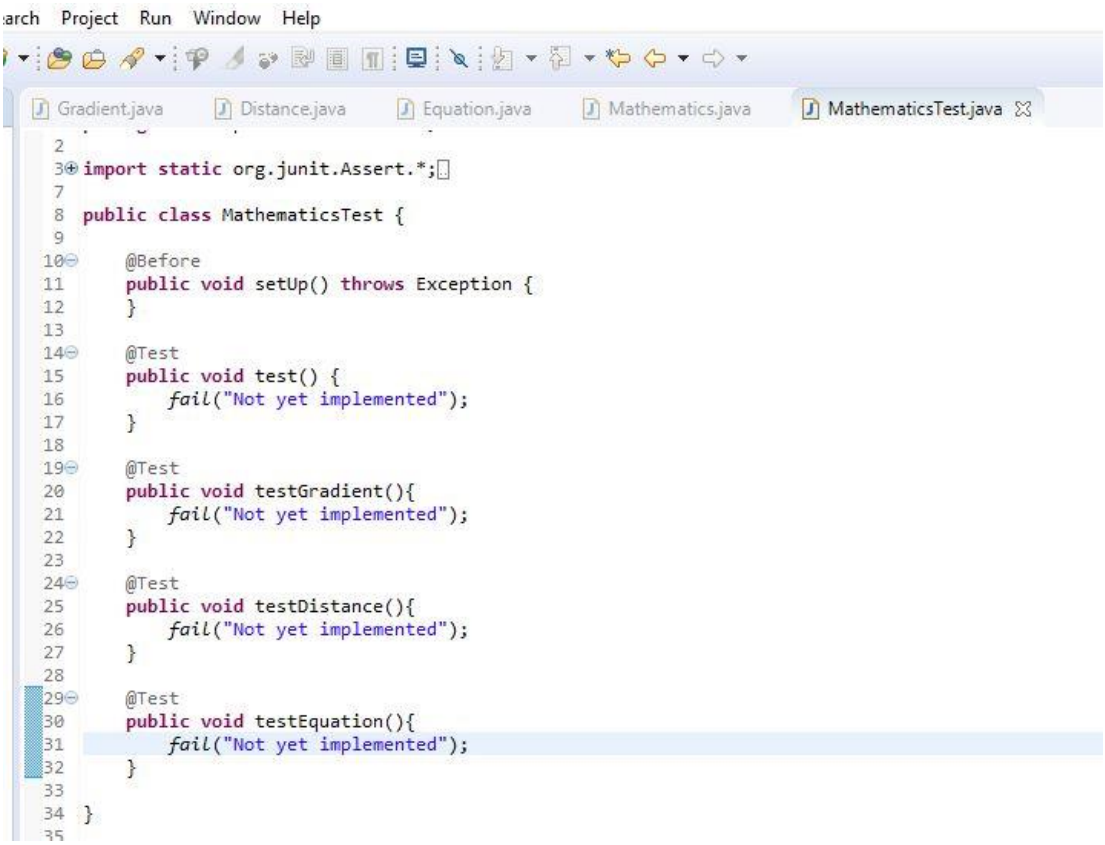
Steps 5: Creating folder testcases in order to separate the test file.



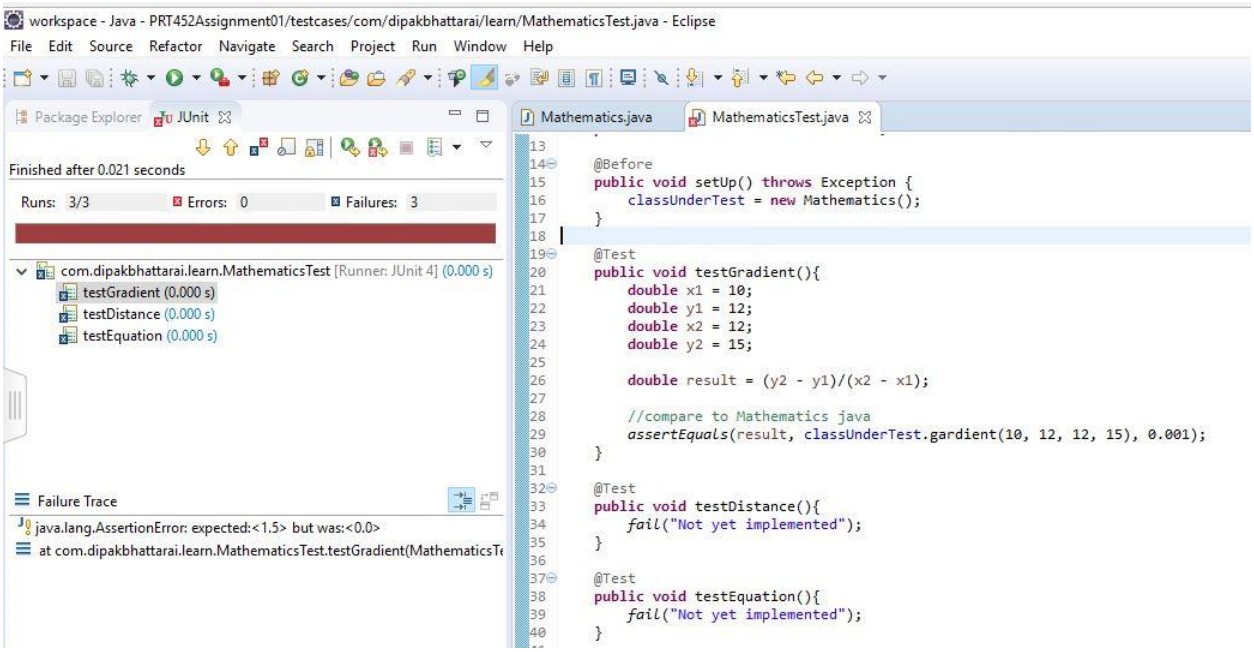
Steps 6: Creating the JuntTesting of the file Mathematics.java



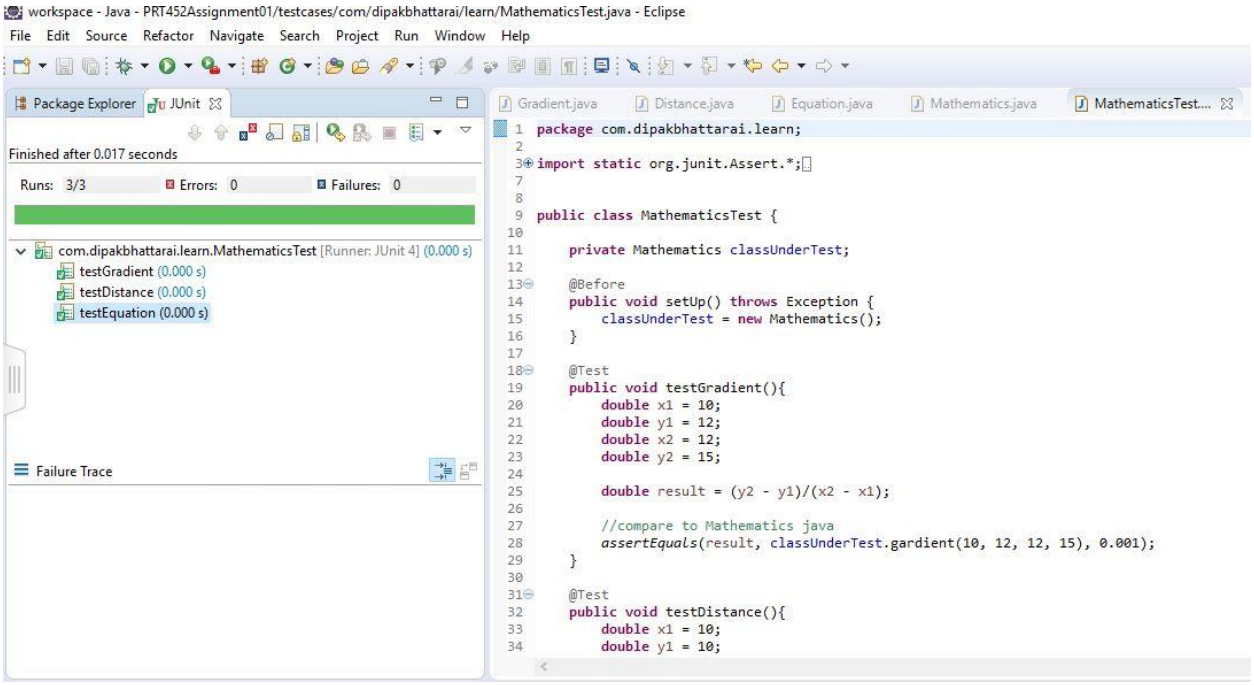
The follow picture shows the JunitTesting of the methods gradient, distance and equation:



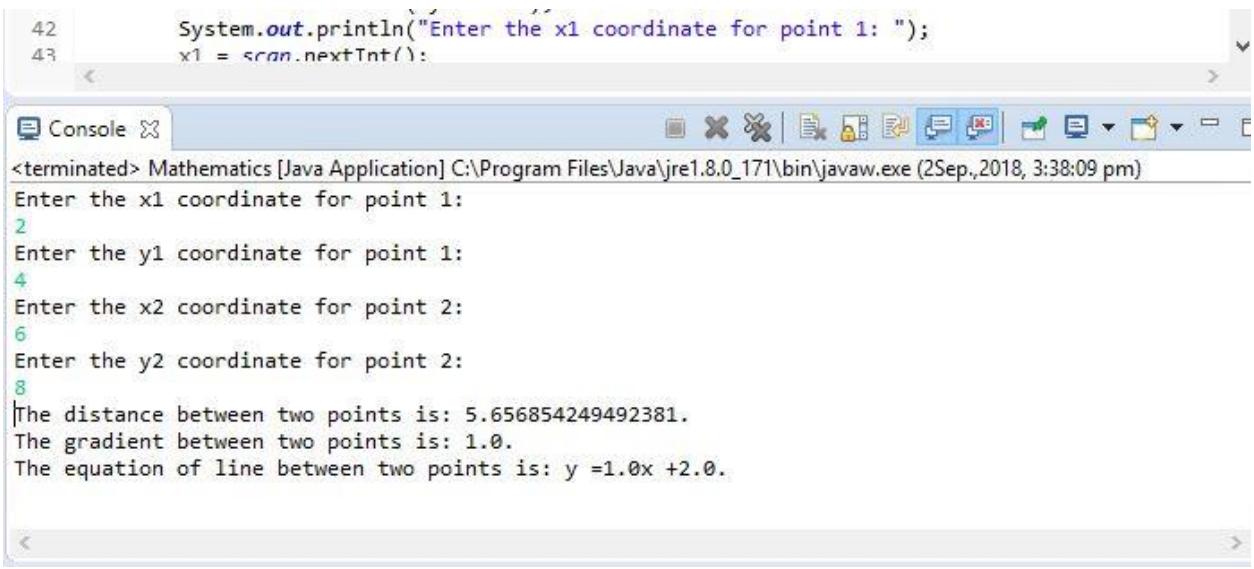
Steps 7: The testing fail showing the unmatched result.



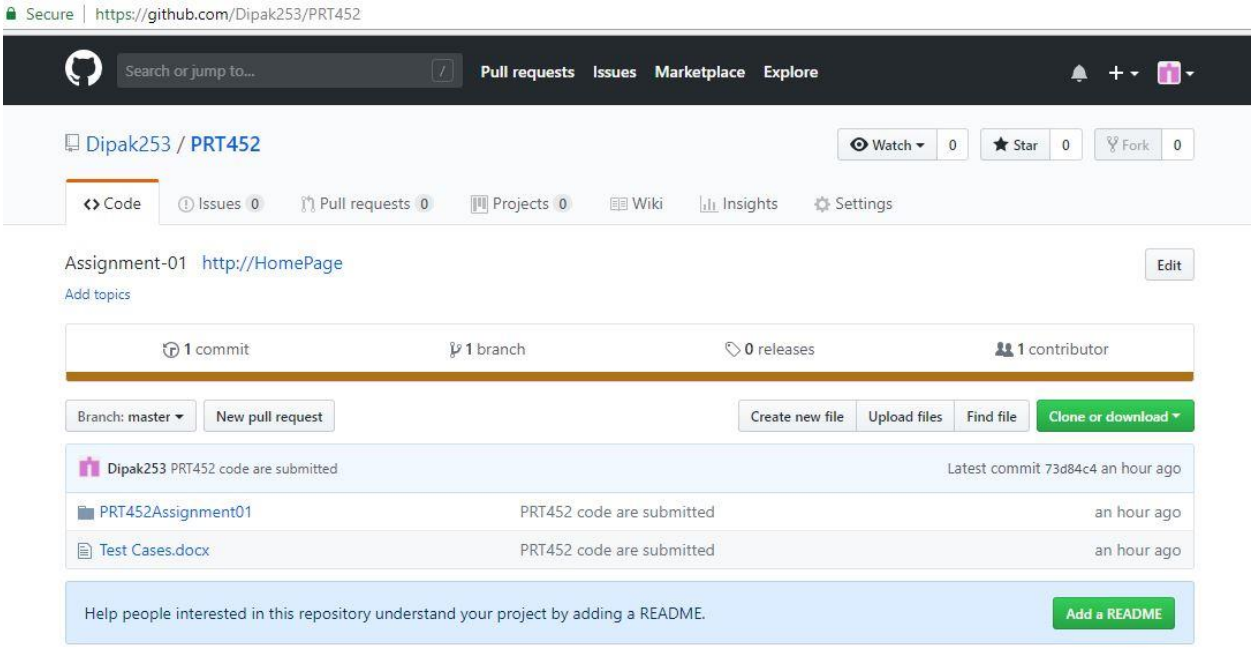
Steps 8: After implementing the codes the test is finally passed.



Steps 9: The final output of the program when user enters the two points.



Steps 10: Creating the github repository for the assignment.



Part 3: Code Smells

The five issues related to code smells are identified and the solution for them are discussed below as:

1) **Lazy Class**: Creating a class costs money. If the class which is not doing enough should be eliminated.

   Solution:

   - **Collapse Hierarchy**: It will collapse all the subclasses that aren't doing enough.
   - **Inline Component**: The useless components should be subjected using this method.

2) **Temporary Field**: An object needs its variables to be instantiated but sometimes some variables are only set for certain circumstances. Such code is difficult to understand.

   Solution:

   - **Extract Component**: It helps to collect all the concerns variables in the component.
   - **Introduce Null Object**: It helps to eliminate conditional code and create an alternative component for invalid variables.

3) **Middle Man**: Sometimes the internal details of objects are encapsulated.

Solution:

- **Move Method** and **Move Field**: This methods are used to move features out the middle man into the other objects making the middle man empty.

4) Large Class: In large class, there are number of objects and its variables but all these variables are not be used at all.

Solution:

- **Extract Component**: It helps to bundle up the variables and
- **Extract subclass**: If the subset of variables are constant then Extract subclass can be used to overcome this problem

5) Duplicated code: It means repetitive use of the code in a program which is not a good practice.

Solution:

- **Extract Method:** This method is used to separate the similar codes and invoke the code from other place.