1. **Poly Shapes**

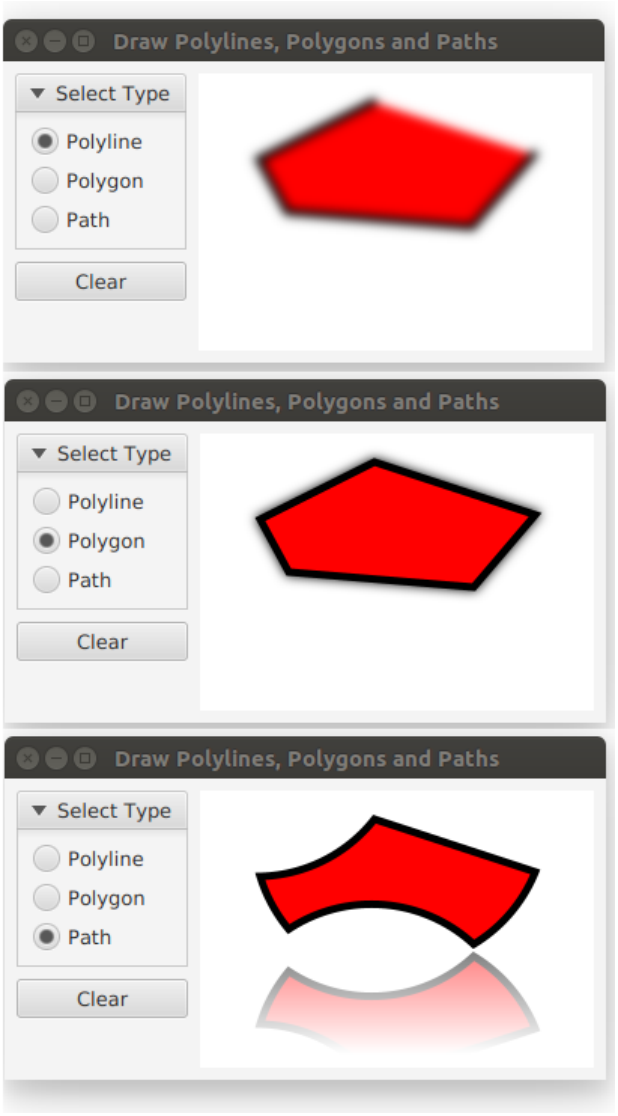
   Write a javafx program for poly shapes {Polyline, Polygon, Path}. Use 3 RadioButtons for shape selection. Click on the pane to add a point. Click the button “Clear” to clear all the points.

   - Polyline : GaussianBlur
   - Polygon : DropShadow
   - Path : Reflection

   Note:

   Modify your homework with fxml, you don’t need to modify java code.

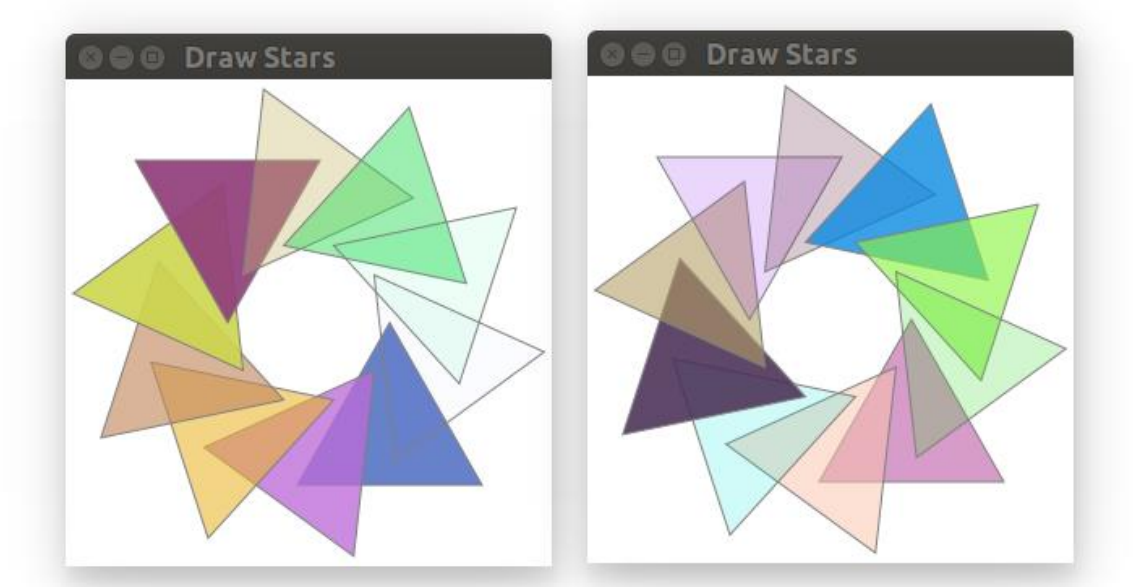
   Sample Output



2. **Draw Triangles**

Write a javafx program for drawing triangles. Draw 10 regular triangles on a ring, each with different rotation angles and random color.

Sample Output



3. **Graph of f(x)**

** Code given at the end of file **

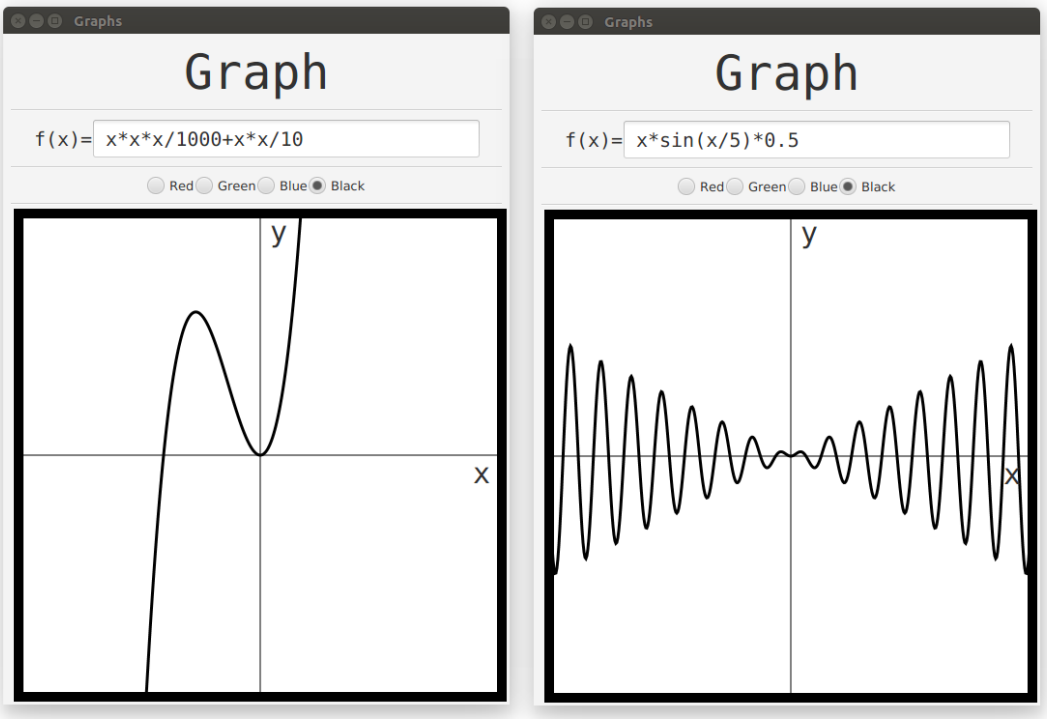
Write a javafx program for graph of f(x). Use Textfield to input f(x) expression. Plot the graph on the pane after "enter" pressed. Expressions include the following tokens: x + - * / ( ) sin cos tan sqrt pow log abs PI E. No worry about invalid expression.

- Pane size: 500x500.
- Graph range: -250 < x,y < 250.
- Number of samples: 500.

Sample Input

x*x*x/1000+x*x/10
100*cos(x/15-PI/4)+x
x*sin(x/5)*0.5
sqrt(abs(x))*10
pow(E,-pow(x/20,2)/10)*200

Sample Output



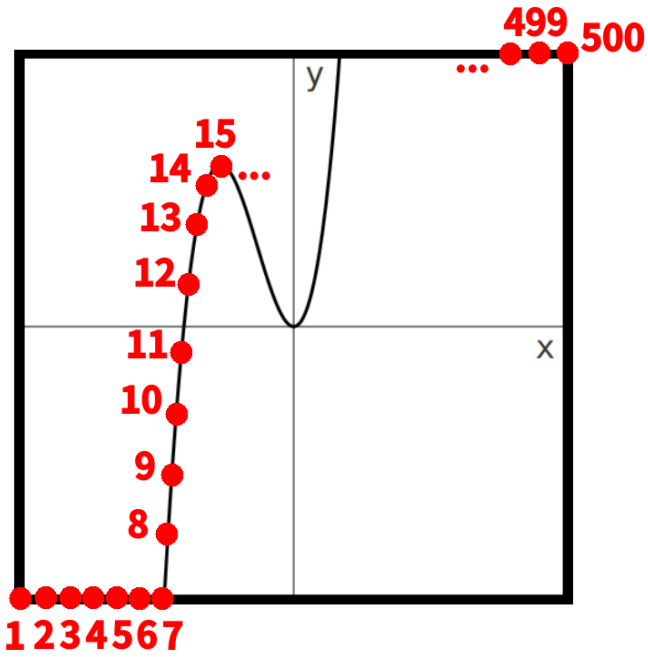
Note

How to plot the graph?

Put 500 points in a polyline.

How to calculate f(x)?

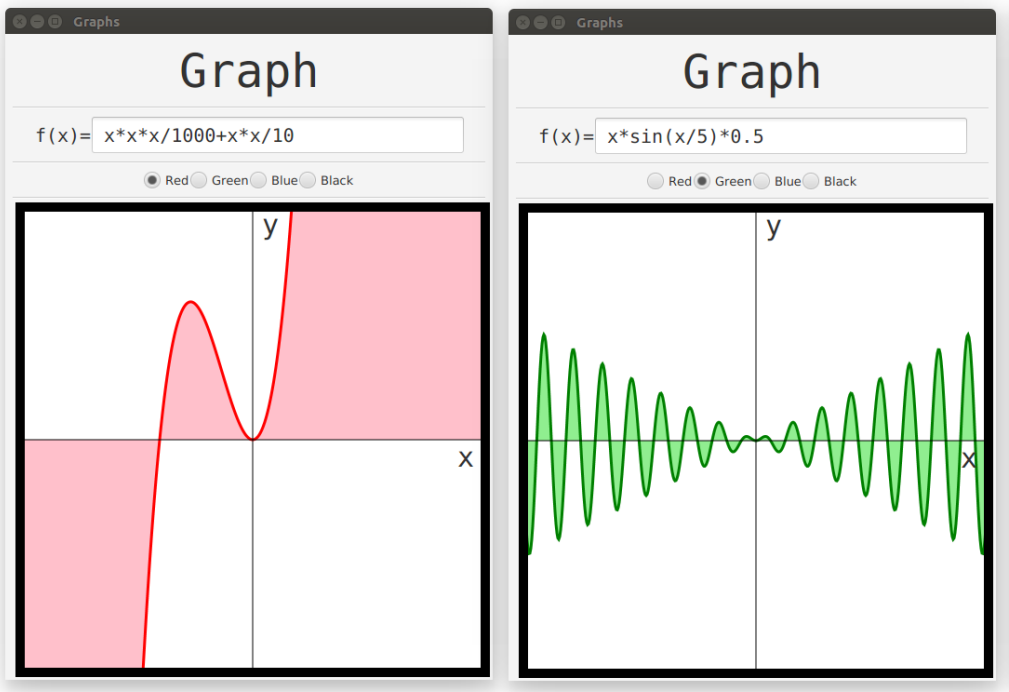
Use javax.script.ScriptEngine!



4. Graph of f(x) (continued)

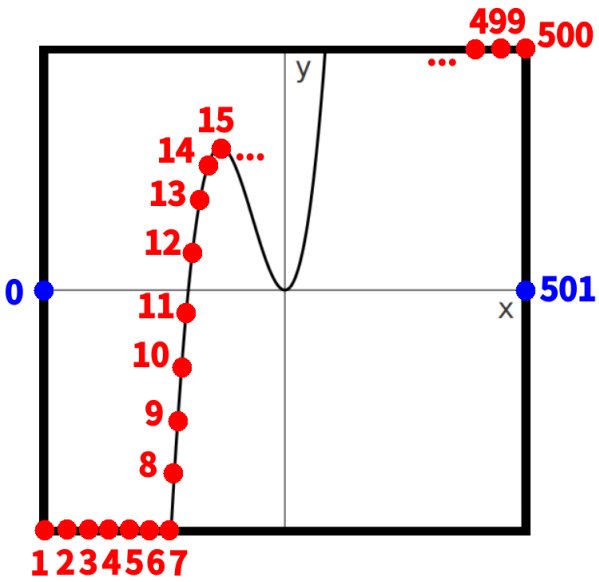
Please modify your code in problem 3, fill the area between X-axis and f(x) with some color. Use 4 RadioButtons for color selection. Colors: RED+PINK, GREEN+LIGHTGREEN, BLUE+LIGHTBLUE, BLACK+WHITE

Sample Output



Note

How to fill the area? ...



Code for Problem 3 & 4

Test.java

```
// Test.java
import javax.script.*;

public class Test {
	public static void main(String[] args) {

		// setup
		ScriptEngineManager manager = new ScriptEngineManager();
		ScriptEngine engine = manager.getEngineByName("JavaScript");

		// input: x, fx
		double x = -49;
		String fx = "Math.sqrt(Math.abs(x))*10+17";

		// output: y
		double y = 0;

		// eval
		try {
			engine.eval("x = ("+ x+")*1.0");
			engine.eval("y = ("+fx+")*1.0");
			y = (double)engine.get("y");
		} catch (ScriptException e) {
			y = 0;
		}

		// result
		System.out.println("x  = "+x);  // x  = -49.0
		System.out.println("fx = "+fx); // fx = Math.sqrt(...
		System.out.println("y  = "+y);  // y  = 87.0
	}
}
```

Graph.java

```
import javafx.application.Application;
import javafx.fxml.FXMLLoader;
import javafx.scene.Parent;
import javafx.scene.Scene;
import javafx.stage.Stage;

public class Graph extends Application {
	@Override
	public void start(Stage stage) throws Exception {
		Parent root =
FXMLLoader.load(getClass().getResource("Graph.fxml"));
		Scene scene = new Scene(root);
		stage.setTitle("Graph");
		stage.setScene(scene);
```

```
            stage.show();
      }
      public static void main(String[] args) {
            launch(args);
      }
}
```

GraphController.java

```
import javafx.event.ActionEvent;
import javafx.fxml.FXML;
import javafx.scene.control.*;
import javafx.scene.input.*;
import javafx.scene.shape.*;
import javafx.scene.paint.Color;
import javafx.scene.effect.*;

public class GraphController {
      @FXML private TextField textfield;
      @FXML private RadioButton buttonRed;
      @FXML private RadioButton buttonGreen;
      @FXML private RadioButton buttonBlue;
      @FXML private RadioButton buttonBlack;
      @FXML private Polyline polyline;

      public void initialize() { }

      @FXML
      private void onActionButton(ActionEvent e) {
            // color selection ...
      }

      @FXML
      private void onActionTextfield(ActionEvent e) {
            // draw f(x) ...
            polyline.getPoints().clear();
            polyline.getPoints().addAll(20.0,30.0);
            polyline.getPoints().addAll(200.0,200.0);
            polyline.getPoints().addAll(300.0,100.0);
      }
}
```

Graph.fxml

```
<?xml version="1.0" encoding="UTF-8"?>

<?import javafx.geometry.Insets?>
<?import javafx.scene.control.Label?>
<?import javafx.scene.control.RadioButton?>
<?import javafx.scene.control.Separator?>
<?import javafx.scene.control.TextField?>
<?import javafx.scene.control.ToggleGroup?>
<?import javafx.scene.layout.BorderPane?>
<?import javafx.scene.layout.HBox?>
<?import javafx.scene.layout.Pane?>
```

```
<?import javafx.scene.layout.VBox?>
<?import javafx.scene.shape.Line?>
<?import javafx.scene.shape.Polyline?>
<?import javafx.scene.shape.Rectangle?>
<?import javafx.scene.text.Font?>

<BorderPane xmlns="http://javafx.com/javafx/11.0.1" xmlns:fx="http://javafx.com/fxml/1" fx:controller="GraphController">
  <padding>
    <Insets bottom="8.0" left="8.0" right="8.0" top="8.0" />
  </padding>
  <center>
    <Pane maxHeight="-Infinity" maxWidth="-Infinity" minHeight="-Infinity" minWidth="-Infinity" prefHeight="500.0" prefWidth="500.0" style="-fx-background-
color: white;" BorderPane.alignment="CENTER">
      <BorderPane.margin>
        <Insets left="8.0" />
      </BorderPane.margin>
      <children>
        <Polyline fx:id="polyline" fill="WHITE" layoutX="0.0" layoutY="0.0" strokeWidth="3.0" />
        <Rectangle fill="#ffffff00" height="510.0" layoutX="-5.0" layoutY="-5.0" stroke="BLACK" strokeType="INSIDE" strokeWidth="10.0" width="510.0" />
        <Line endX="500.0" endY="250.0" startY="250.0" />
        <Line endX="250.0" endY="500.0" startX="250.0" />
        <Label layoutX="470.0" layoutY="250.0" text="x">
          <font>
            <Font name="Monospaced Regular" size="30.0" />
          </font>
        </Label>
        <Label layoutX="260.0" text="y">
          <font>
            <Font name="Monospaced Regular" size="30.0" />
          </font>
        </Label>
      </children>
    </Pane>
  </center>
  <top>
    <VBox alignment="CENTER" BorderPane.alignment="CENTER">
      <children>
        <Label alignment="CENTER" maxWidth="1.7976931348623157E308" text="Graph">
          <font>
            <Font name="Monospaced Regular" size="50.0" />
          </font>
        </Label>
        <Separator prefHeight="20.0" />
        <HBox alignment="CENTER">
          <children>
            <Label alignment="CENTER" text="f(x)=">
              <font>
                <Font name="Monospaced Regular" size="20.0" />
              </font>
            </Label>
            <TextField fx:id="textfield" onAction="#onActionTextfield" prefWidth="400.0" text="">
              <font>
                <Font name="Monospaced Regular" size="20.0" />
              </font>
            </TextField>
          </children>
        </HBox>
        <Separator prefHeight="20.0" />
        <HBox alignment="CENTER">
          <children>
            <RadioButton fx:id="buttonRed" mnemonicParsing="false" onAction="#onActionButton" text="Red">
              <toggleGroup>
                <ToggleGroup fx:id="group" />
              </toggleGroup>
            </RadioButton>
            <RadioButton fx:id="buttonGreen" mnemonicParsing="false" onAction="#onActionButton" text="Green" toggleGroup="$group" />
            <RadioButton fx:id="buttonBlue" mnemonicParsing="false" onAction="#onActionButton" text="Blue" toggleGroup="$group" />
            <RadioButton fx:id="buttonBlack" mnemonicParsing="false" onAction="#onActionButton" selected="true" text="Black" toggleGroup="$group" />
          </children>
        </HBox>
        <Separator prefHeight="20.0" />
      </children>
    </VBox>
  </top>
</BorderPane>
```