

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.

- Left Click: add new point
- Right Click: remove the last point

Note:

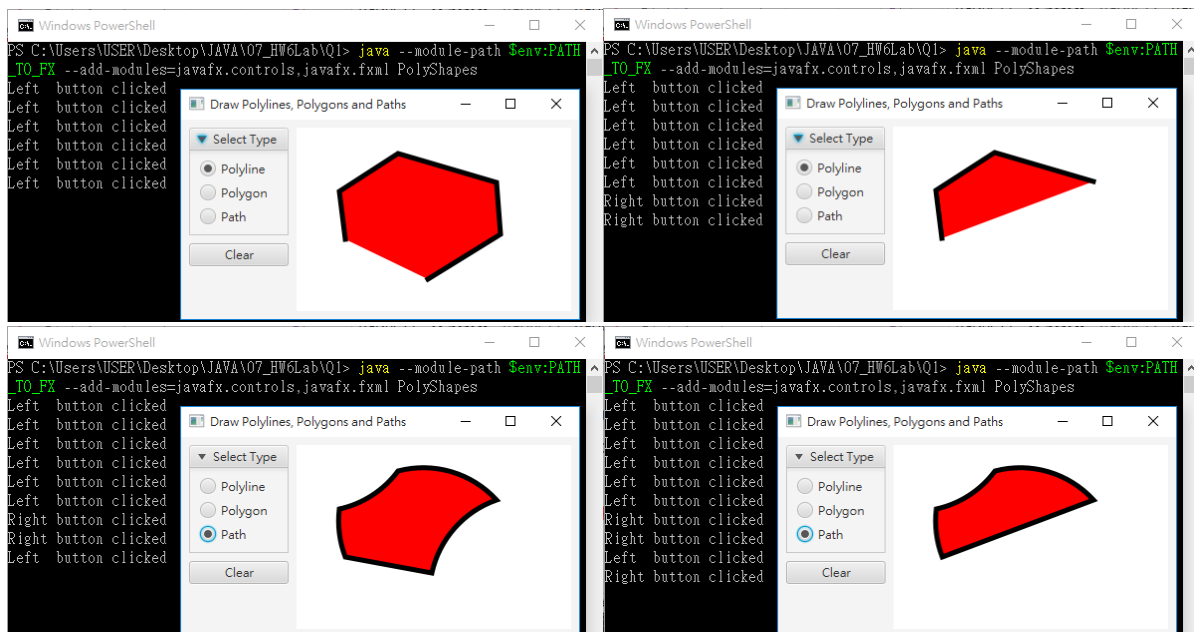
To determine which mouse button is clicked, you can refer to <https://docs.oracle.com/javafx/2/api/javafx/scene/input/MouseButton.html>

Class: javafx.scene.input.MouseButton

If (e.getButton() == MouseButton.PRIMARY) ... // button 1, usually the left

If (e.getButton() == MouseButton.SECONDARY) // button 3, usually the right

Sample Output

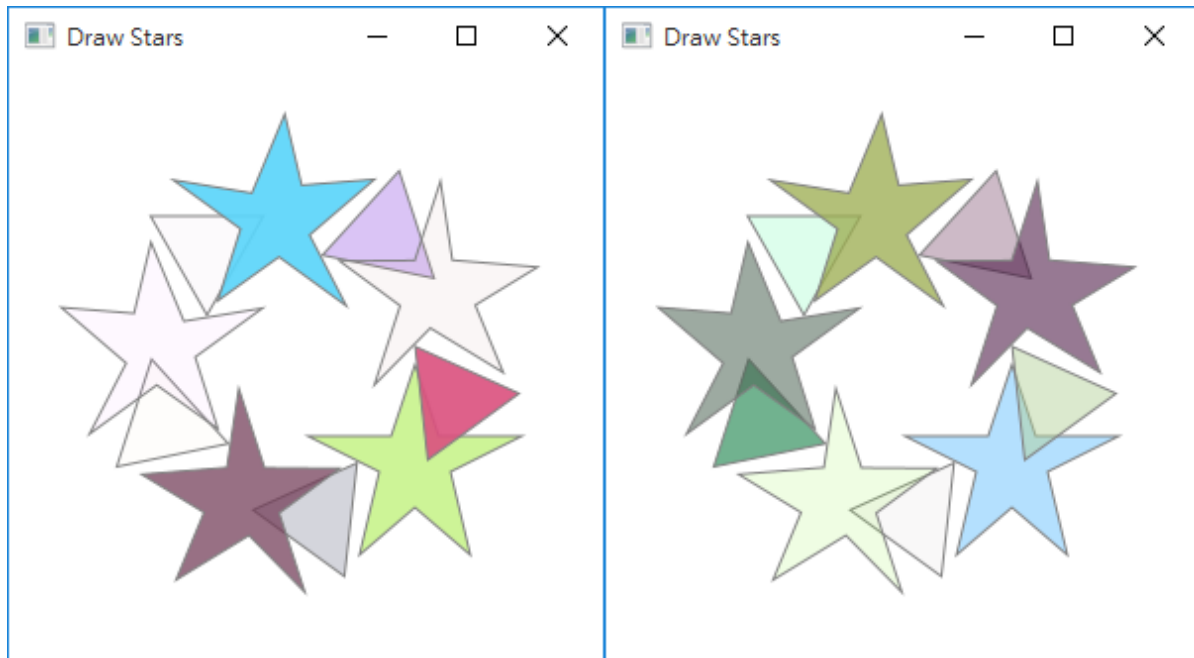


2. Draw Stars and Triangles

Write a javafx program for drawing stars and triangles. Draw 5 stars and 5 regular triangles term by term on a ring, each with different rotation angles and random color.

You can specify the size of triangle, but it shall be regular triangle.

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

$x^3x/1000+x^3x/10$

$100*\cos(x/15-PI/4)+x$

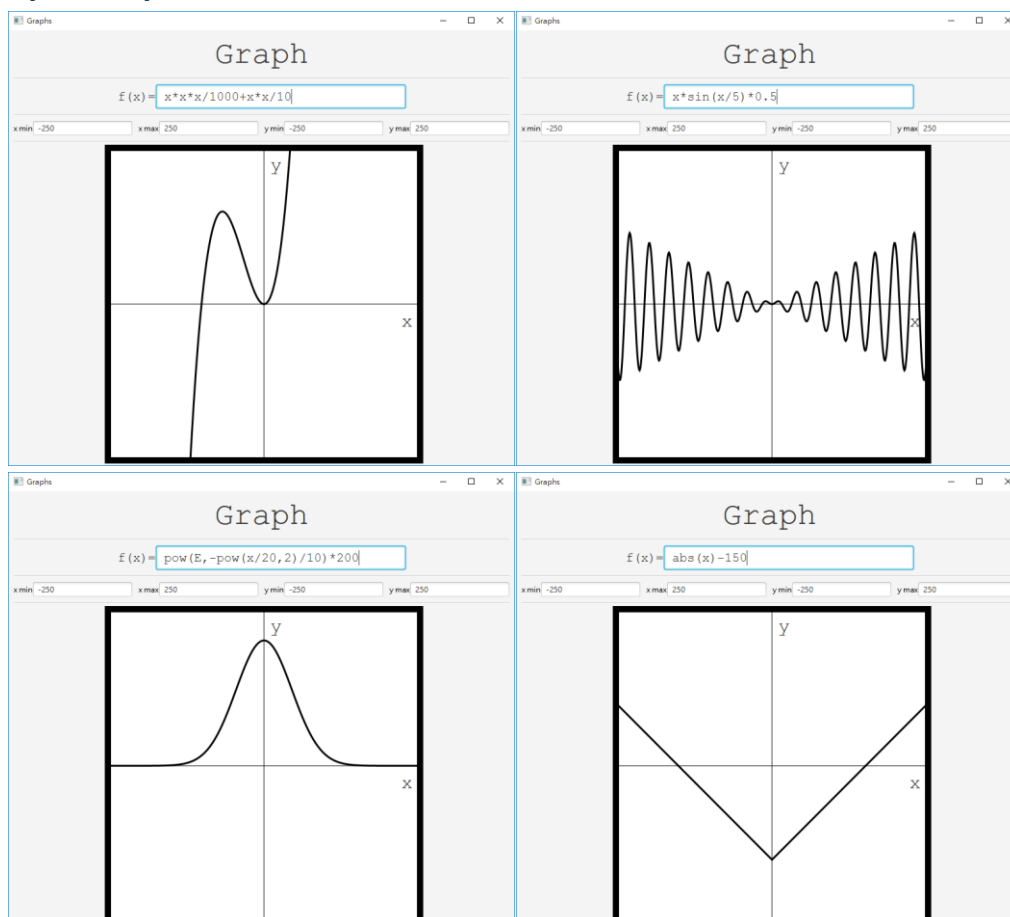
$x*\sin(x/5)*0.5$

$\sqrt{\text{abs}(x)}*10$

$\text{pow}(E, -\text{pow}(x/20, 2)/10)*200$

$\text{abs}(x)-150$

Sample Output



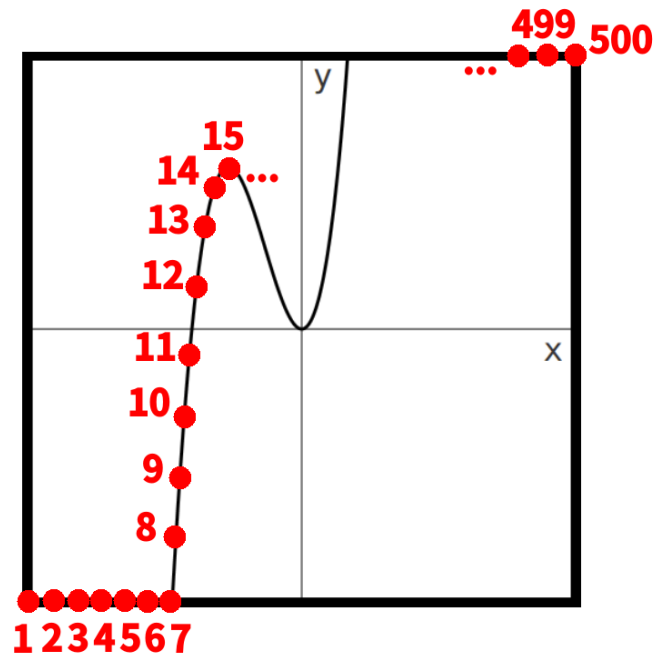
Note

How to plot the graph?

Put 500 points in a polyline.

How to calculate $f(x)$?

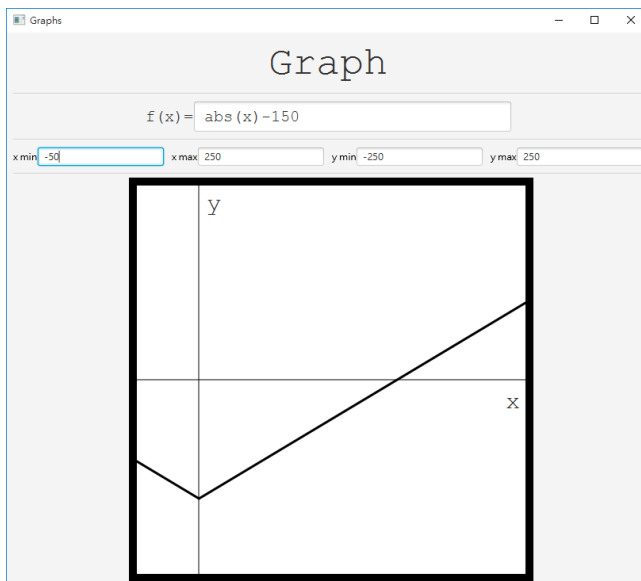
Use `javax.script.ScriptEngine!`



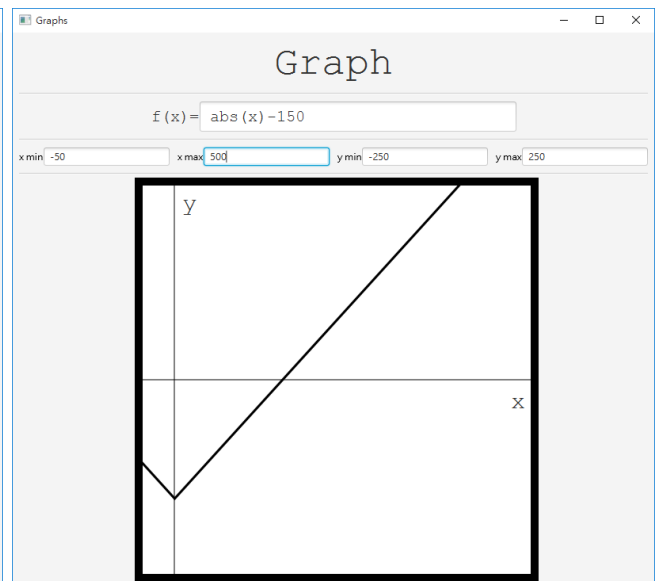
4. Graph of $f(x)$ (continued)

Please modify your code in problem 3, provide 4 TextField for users to determine x_{min} , x_{max} , y_{min} , and y_{max} . Also, the x -axis and y -axis shall move as modifying.

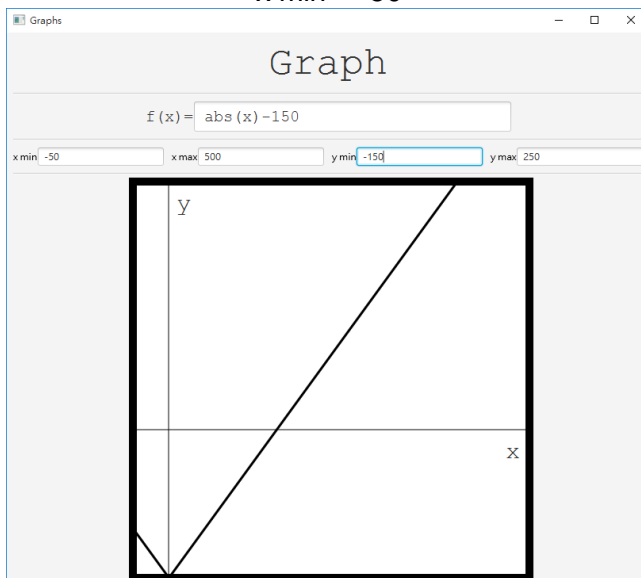
Sample Output



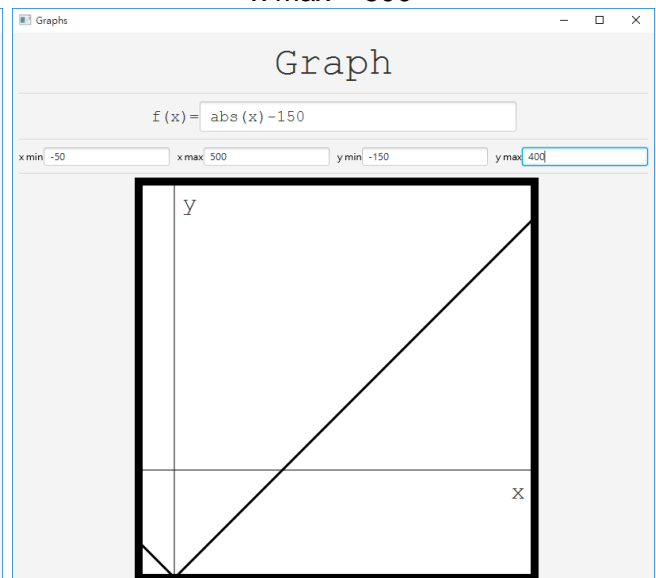
$x_{min} = -50$



$x_{max} = 500$



$y_{min} = -150$



$y_{max} = 400$

Code for Problem 3 & 4

Test.java // you can learn how to use the function “eval” in this program.

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

public class GraphController {
    //variable you need
    int x_min = -250;
    int x_max = 250;
    int y_min = -250;
    int y_max = 250;

    @FXML private TextField textfield;
    @FXML private TextField xmin;
    @FXML private TextField xmax;
    @FXML private TextField ymin;
    @FXML private TextField ymax;
    @FXML private Polyline polyline;
    @FXML private Line axisx;
    @FXML private Line axisy;
    @FXML private Label labelx;
    @FXML private Label labely;

    public void initialize() {

    }

    @FXML
    private void onChangeSize(ActionEvent e) {
        // change layouts of axis and labels.
    }

    @FXML
    private void onActionTextfield(ActionEvent e) {
        // draw f(x) ...
        polyline.getPoints().clear();
        polyline.getPoints().addAll(123.456, 111.666666);
        polyline.getPoints().addAll(200.0, 200.0);
        polyline.getPoints().addAll(300.0, 100.0);
    }
}

```

```

    }
}

/*
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

*/

```

Graph.fxml

```

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

<!-- PolyShapes.fxml -->
<!-- GUI for manipulating a Polyline, a Polygon -->

<?import javafx.geometry.Insets?>
<?import javafx.scene.control.Label?>
<?import javafx.scene.control.Separator?>
<?import javafx.scene.control.TextField?>
<?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?>
<?import javafx.scene.text.Text?>

<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 fx:id="axisx" endX="500.0" endY="250.0" startY="250.0" />
                <Line fx:id="axisy" endX="250.0" endY="500.0" startX="250.0" />
            </children>
        </Pane>
    </center>
</BorderPane>

```



```

        <Label fx:id="labelx" layoutX="470.0" layoutY="250.0"
text="x">
            <font>
                <Font name="Monospaced Regular" size="30.0" />
            </font>
        </Label>
        <Label fx:id="labely" 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="100*cos(x/15-
PI/4)+x">
                        <font>
                            <Font name="Monospaced Regular" size="20.0" />
                        </font>
                    </TextField>
                </children>
            </HBox>
            <Separator prefHeight="20.0" />
            <HBox alignment="CENTER">
                <children>
                    <Text strokeType="OUTSIDE" strokeWidth="0.0" text="x
min" />
                    <TextField onAction="#onChangeSize" promptText="x min"
text="-250" fx:id="xmin">
                        <HBox.margin>
                            <Insets right="10.0" />
                        </HBox.margin>
                    </TextField>
                    <Text strokeType="OUTSIDE" strokeWidth="0.0" text="x
max" />
                    <TextField onAction="#onChangeSize" text="250"
fx:id="xmax">
                        <HBox.margin>

```

```

        <Insets right="10.0" />
    </HBox.margin>
</TextField>
<Text strokeType="OUTSIDE" strokeWidth="0.0" text="y
min" />
text="-250">
    <HBox.margin>
        <Insets right="10.0" />
    </HBox.margin>
</TextField>
<Text strokeType="OUTSIDE" strokeWidth="0.0" text="y
max" />
text="250">
    <HBox.margin>
        <Insets />
    </HBox.margin>
</TextField>
</children>
</HBox>
<Separator prefHeight="20.0" />
</children>
</VBox>
</top>
</BorderPane>

```