**Graphing calculator software design**

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**Purpose and functionality:**

The purpose of this software is to successfully graph, on a Cartesian plane, a quadratic function (in the form y=ax2 +bx+c) or a linear function (in the form y=mx+b). The user must specify the function and the minimum and maximum x-values to be displayed. The program will output a graph of the function, the roots of the function, the slope, the y-intercept, the vertex and the direction of opening if the function is quadratic.

**List of Functions and Procedures:**

1. **seperateFunctionstring:**

* Receives the user inputted function string and extracts the a,b, and c values of the function
* This procedure can also detect fractions
* If the function is linear, a=0

1. **isQuadorLinear:**

* Receives the user-inputted function string and checks whether or not the function is linear or Quadratic.
* If it is Quadratic, the procedure returns True
* If it is Linear, False

1. **calculateYvalue:**

* Receives an x-value and the user inputted function string and returns the y-value that the function would produce for the specific x-value.

1. **getRatioforxaxis:**

* Receives the user inputted xMax and xMin and returns the scaling ratio for the x-axis

1. **getRatioforyaxis:**

* Receives the user inputted xMax and xMin and returns the scaling ratio for y-axis
* The y-Max and yMin values are calculated using the xMax and xMin values and the calculateYvalue function

1. **generateOrderedpairs:**

* Receives the xMax and xMin values as well as the user-inputted functionstring.
* Generates ordered pairs between the xMax and xMin and scales both the resulting y-values and the x-values.
* The x and y values are stored in an array
* This array is returned

1. **getRoots:**

* Receives the user-inputted function string and outputs the roots of the function

1. **getYintercepts:**

* Receives the user-inputted function string and outputs the y-intercepts of the function

1. **getSlope:**

* Receives the user-inputted function string and outputs the slope of the function, if it is linear. Otherwise, the function will inform the user that the inputted function is quadratic

1. **getVertexandopening:**

* Receives the user-inputted function string and outputs the vertex and the direction that the function opens

1. **drawFunction:**

* Receives the function string, the xMax and Min.
* This procedure draws the x and y axis and labels them according to scale
* This procedure also draws out all the points of the function
* This function prints out the key information of the function (slope, vertex, direction, intercepts, and roots)

**Delegation of tasks:**

Muneeb:

* Will complete #1-3,9
* Will create test cases

Sanan:

* Will complete #4,5

Faraz:

* Will complete #6-8

Islam:

* Will complete #10,11
* will create input statements and variables

**Test Cases:**

**\*All test cases work, however, the numbers on the y-axis may get squished when using large xMax and xMin values\***

|  |  |  |
| --- | --- | --- |
| Function | Results | Is it working? |
| y = x2 + 6x + 5 | Graph the function  Roots: (-1, -5)  No slope  y-int (5)  Vertex = (-3,-4)  Direction is up | Yes |
| y = x2 + 2x | Graph the function  Roots: (-2,0)  No slope  y-int (0)  Vertex = (-1,-1)  Direction is up | Yes |
| y = x2 + 10 | Graph the function  Roots: Complex roots  No slope  y-int (10)  Vertex = (0,10)  Direction is up | Yes |
| y = 5x + 11 | Graph the function  Roots: -2.2  Slope = 5  y-int (11)  Vertex = none  No direction | Yes |
| y = -4x2 - 2x -5 | Graph the function  Roots: Complex Roots  No slope  y-int (-5)  Vertex = (-1/4, -19/4)  Direction is Down | Yes |
| y = 3x2 - 10x + 5 | Graph the function  Roots: 2.72075922, 0.6125741133  No slope  y-int (5)  Vertex = (5/3, -10/3)  Direction is up | Yes |
| y = -2x + 45 | Graph the function  Roots: 22.5  Slope = -2  y-int(45)  No Vertex  Direction is Down | Yes |
| y = | Graph the function  Roots: -0.8  Slope = 0.5  y-int ( 0.4)  No vertex  Direction is up | Yes |
|  | Graph the function  Roots: Complex Roots  Slope = no slope  y-int(0.75)  Vertex = (-3/32, 381/512)  Direction is Up | Yes |
| y = 3x | Graph the function  Roots: 0  Slope: 3  y-int (0)  no vertex  direction is up | Yes |