User Guide to Run the Program (Exercise 10)

1. Download ManalangEx10.zip file. The file contains the following files:
   a. ManalangEx08.R
   b. ManalangEx09.R
   c. ManalangEx10.R
   d. README.txt
2. Open ManalangEx10.R in RStudio and install the following packages:
   a. shiny by ' install.package("shiny") '
   b. shinyMatrix by ' install.package("shinyMatrix") '
3. Run the ManalangEx10.R file. (ctrl + alt + r)
4.

Exercise 10 GUI Manual

1. The application contains 2 tabs, namely:
   a. Quadratic Spline Interpolation. This contains the implementation of the exercise 8.
   b. Simplex Method. This contains the implementation of exercise 9.
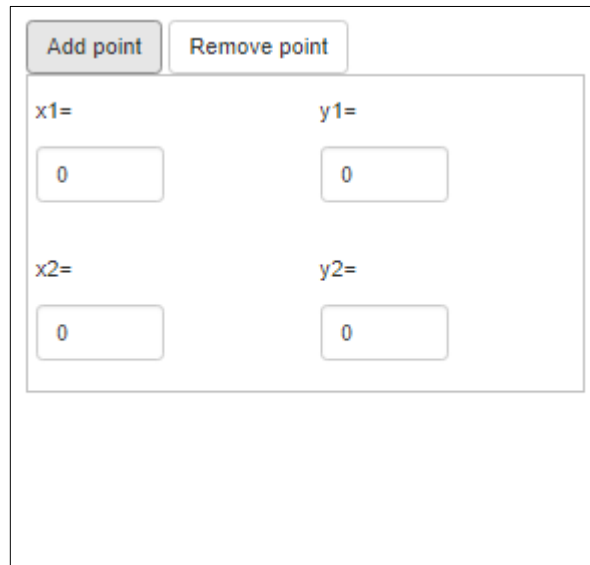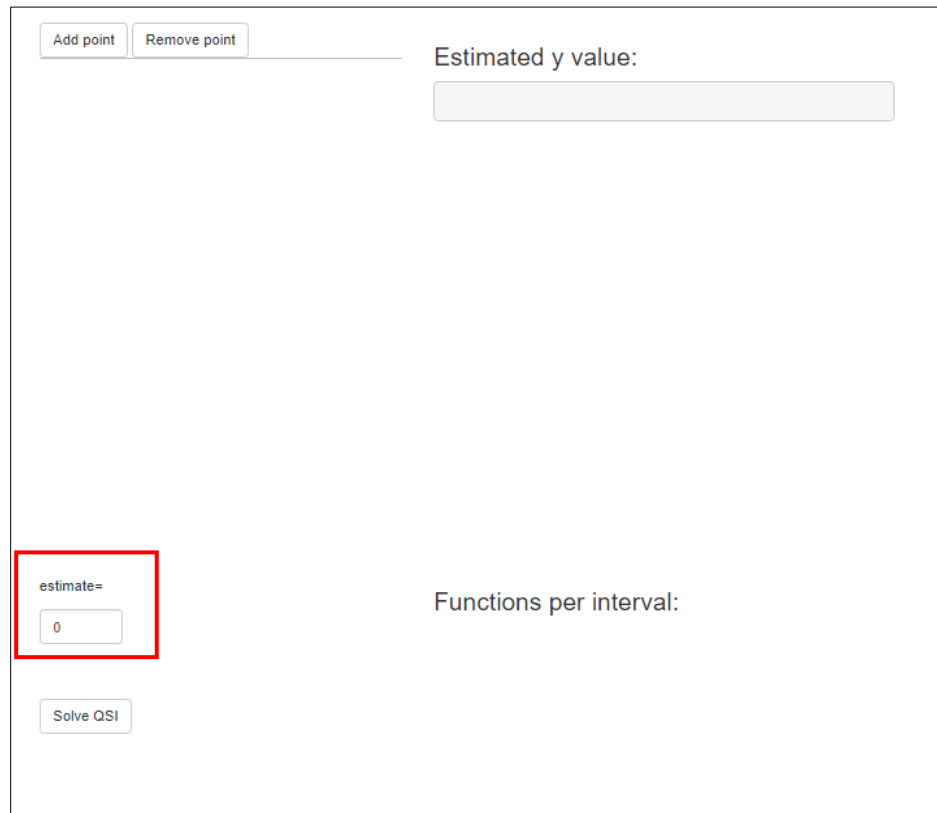
2. Quadratic Spline Interpolation

   a. "Add point" button adds a point that has initial coordinates of (0,0). Can add indefinite number of points

   b. "Remove point" button removes the last point that has been created.

   c. The "estimate=" portion is where the user will input the numeric value of x that he/she wants to estimate given his/her data points. This has a default value of 0.

d. "Solve QSI" button estimates the y value based on the current inputs using the QSI.

i. Fail estimation

1. When there is only 2 data points

2. When the data are not sorted

prompt

3. Desired estimation is out of range

prompt

ii.   Success estimation
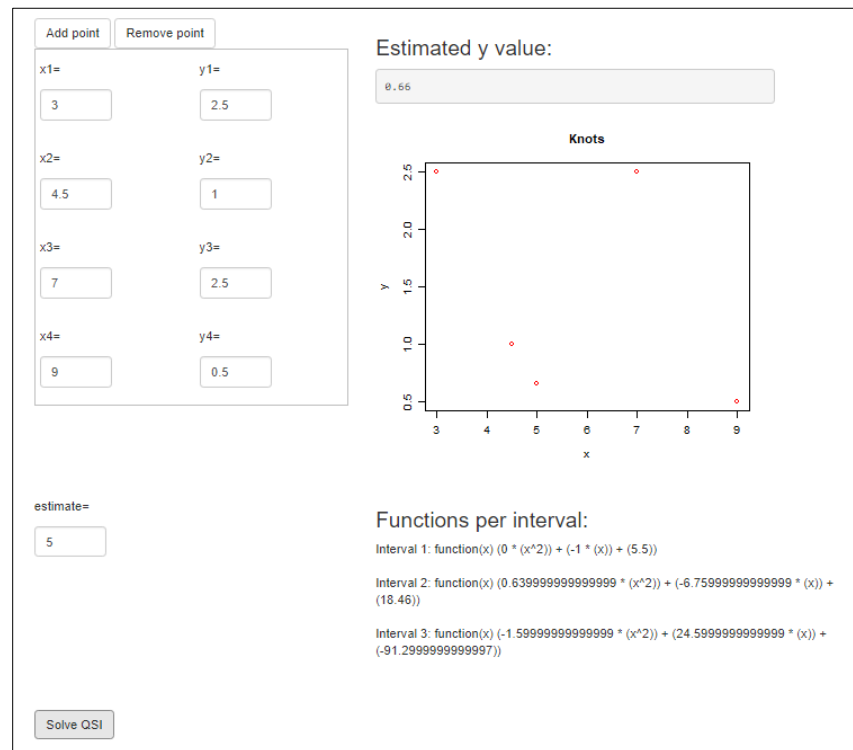
e.   Scatter Plot. Simply shows the position of the given points and the newly estimated value
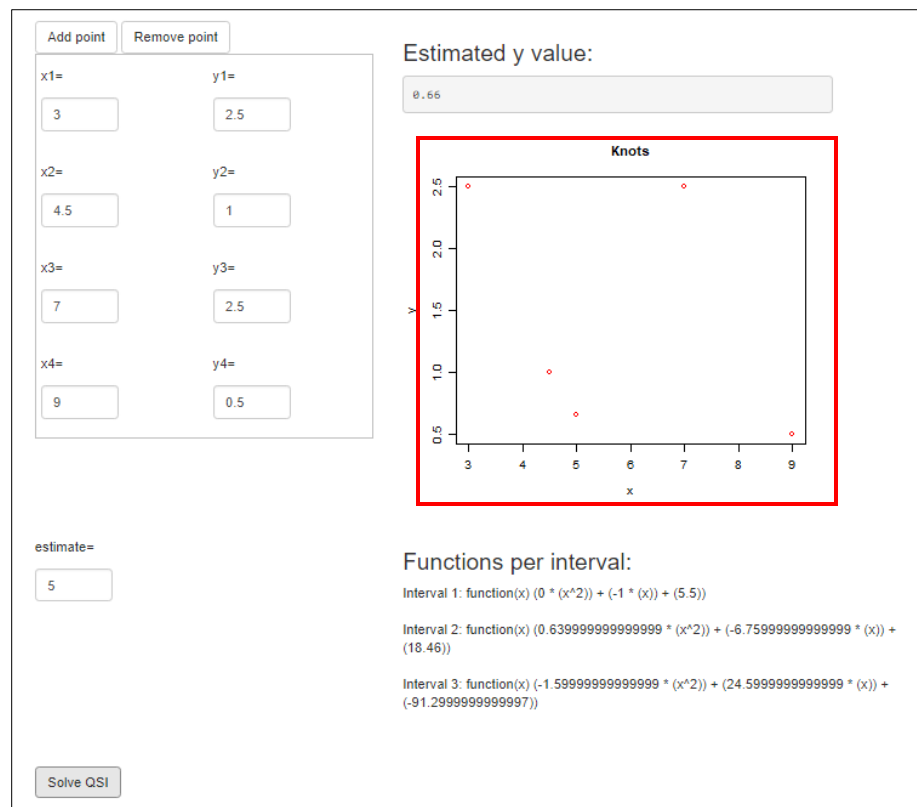
f. Functions per interval. Shows the function per interval if the estimation is successful.

Estimated y value:

0.66

Knots

Functions per interval:

Interval 1: function(x) (0 * (x^2)) + (-1 * (x)) + (5.5))

Interval 2: function(x) (0.639999999999999 * (x^2)) + (-6.75999999999999 * (x)) + (18.46))

Interval 3: function(x) (-1.59999999999999 * (x^2)) + (24.5999999999999 * (x)) + (-91.2999999999997))

3. Simplex Method (Minimization and Maximization)

Variables=

0

Constraints=

0

Type:

Maximization

Result:

Exer 10 Word Problem:

No

Input Values

a. "Variables". Number of variables the user wants.

b. "Constraints". Number of constraints the user wants

c. "Type". The user can either choose maximization or minimization.

d. "Exer 10 Word Problem". Toggle to yes if the input is specific to the word problem of exercise 10.

e. "Result". Where the maximize of minimize value will show.

f. "Input Values" button. When clicked, a matrix that is sized based the input of the user will show. This button will also vanish once clicked.

g. "Compute" button. After the user finished inserting the coefficients, this button can be used to start computing using the Simple method. Will also vanish once clicked.

	Variables=	Type:	Exer 10 Word Problem:
	2	Maximization ▼	No ▼

Constraints=

4

Result:

	x1	x2	RHS
Constraint 1	7	11	77
Constraint 2	10	8	80
Constraint 3	1	0	9
Constraint 4	0	1	6
Objective Function	150	175	0

Compute

h. Example results:

    i. **Variables**: 2,
    Constraints: 4,
    Type: Maximization,
    Exer 10 Word Problem: No

Format: After converting the constraints and objective function into augmented matrix.

NOTE: no slack variables.

Variables= 2

Constraints= 4

Type: Maximization

Exer 10 Word Problem: No

Result:

1413.889

	x1	x2	RHS
Constraint 1	7	11	77
Constraint 2	10	8	80
Constraint 3	1	0	9
Constraint 4	0	1	6
Objective Function	150	175	0

Resulting Tableau

	x1	x2	S1	S2	S3	S4	Z	Solution
Constraint 1	1.00	0.00	-0.15	0.20	0.00	0.00	0.00	4.89
Constraint 2	0.00	0.00	-0.19	0.13	0.00	1.00	0.00	2.11
Constraint 3	0.00	0.00	0.15	-0.20	1.00	0.00	0.00	4.11
Constraint 4	0.00	1.00	0.19	-0.13	0.00	0.00	0.00	3.89
Objective Function	0.00	0.00	10.19	7.87	0.00	0.00	1.00	1413.89

Solution Set

x1	x2	S1	S2	S3	S4	Solution
4.89	3.89	0.00	0.00	4.11	2.11	1413.89

ii. **Variables**: 2,

Constraints: 2,

Type: Minimization,

Exer 10 Word Problem: No

Variables=

2

Constraints=

2

Type:

Minimization ▾

Exer 10 Word Problem:

No ▾

Result:

48

	x1	x2	RHS
Constraint 1	1	2	4
Constraint 2	7	6	20
Objective Function	14	20	1

Resulting Tableau

	S1	S2	x1	x2	Z	Solution
1	0.00	1.00	0.25	-0.12	0.00	1.00
2	1.00	0.00	-0.75	0.88	0.00	7.00
3	0.00	0.00	2.00	1.00	1.00	48.00

Solution Set

S1	S2	x1	x2	Solution
0.00	0.00	2.00	1.00	48.00

iii. **Variables**: 15,

    Constraints: 8,

    Type: Minimization,

    Exer 10 Word Problem: Yes

Variables= 15

Constraints= 8

Type: Minimization

Exer 10 Word Problem: Yes

Result: 3200

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13	x14	x15	RHS
Constraint 1	-1	-1	-1	-1	-1	0	0	0	0	0	0	0	0	0	0	-310
Constraint 2	0	0	0	0	0	-1	-1	-1	-1	-1	0	0	0	0	0	-260
Constraint 3	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-280
Constraint 4	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	180
Constraint 5	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	80
Constraint 6	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	200
Constraint 7	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	160
Constraint 8	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	220
Objective Function	10	8	6	5	4	6	5	4	3	6	3	4	5	5	9	1

Resulting Tableau

	S1	S2	S3	S4	S5	S6	S7	S8	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13	x14	x15	Z	Solution
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	1.00	0.00	0.00	0.00	6.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	1.00	0.00	0.00	0.00	3.00
3	-1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	1.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	1.00	0.00	0.00	0.00	1.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	-1.00	0.00	0.00	-1.00	0.00	1.00	0.00	0.00	0.00	4.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	-1.00	0.00	0.00	0.00	-1.00	1.00	0.00	0.00	0.00	2.00
8	-1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00
9	-1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	-1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	-1.00	0.00	0.00	-1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
11	-1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	-1.00	0.00	0.00	0.00	4.00
12	-1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	-1.00	0.00	0.00	0.00	5.00
13	-1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	-1.00	0.00	0.00	0.00	-1.00	1.00	0.00	0.00	1.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	1.00	0.00	6.00
16	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.00	0.00	220.00	0.00	0.00	100.00	160.00	0.00	180.00	80.00	20.00	0.00	0.00	1.00	3200.00

Solution Set

S1	S2	S3	S4	S5	S6	S7	S8	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13	x14	x15	Solution
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.00	0.00	220.00	0.00	0.00	100.00	160.00	0.00	180.00	80.00	20.00	0.00	0.00	3200.00

Items shipped from a plant to a warehouse

	California	Utah	New Mexico	Illinois	New York
Denver	0.00	0.00	80.00	0.00	220.00
Phoenix	0.00	0.00	100.00	160.00	0.00
Dallas	180.00	80.00	20.00	0.00	0.00
Total	540.00	320.00	980.00	480.00	880.00

References (links only):

- https://shiny.rstudio.com/tutorial/written-tutorial/lesson1/ , lesson 1 to 4

- https://shiny.rstudio.com/gallery/widget-gallery.html , helped in coding widgets

- https://stackoverflow.com/questions/54352046/how-to-get-the-correct-inputid-while-using-insertui-in-shiny , add/remove button in QSI interpolation

- https://www.youtube.com/watch?v=9uFQECk30kA&t=2467s , example apps using R Shiny

- https://stackoverflow.com/questions/23233497/outputting-multiple-lines-of-text-with-rendertext-in-r-shiny , htmlOutput