

# **3TP3 Lab 1 Report**

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Section: T01

## Q1:

For Q1, by using the provided SimpleFunctions.m file and the additivity, shift property and homogeneity of discrete-time impulse (delta) and unit-step functions, for each part, we firstly applied the shift property and homogeneity on each individual signal, and finally applied the additivity to add those individual signals to get the final discrete-time signal.

### Q1(a)

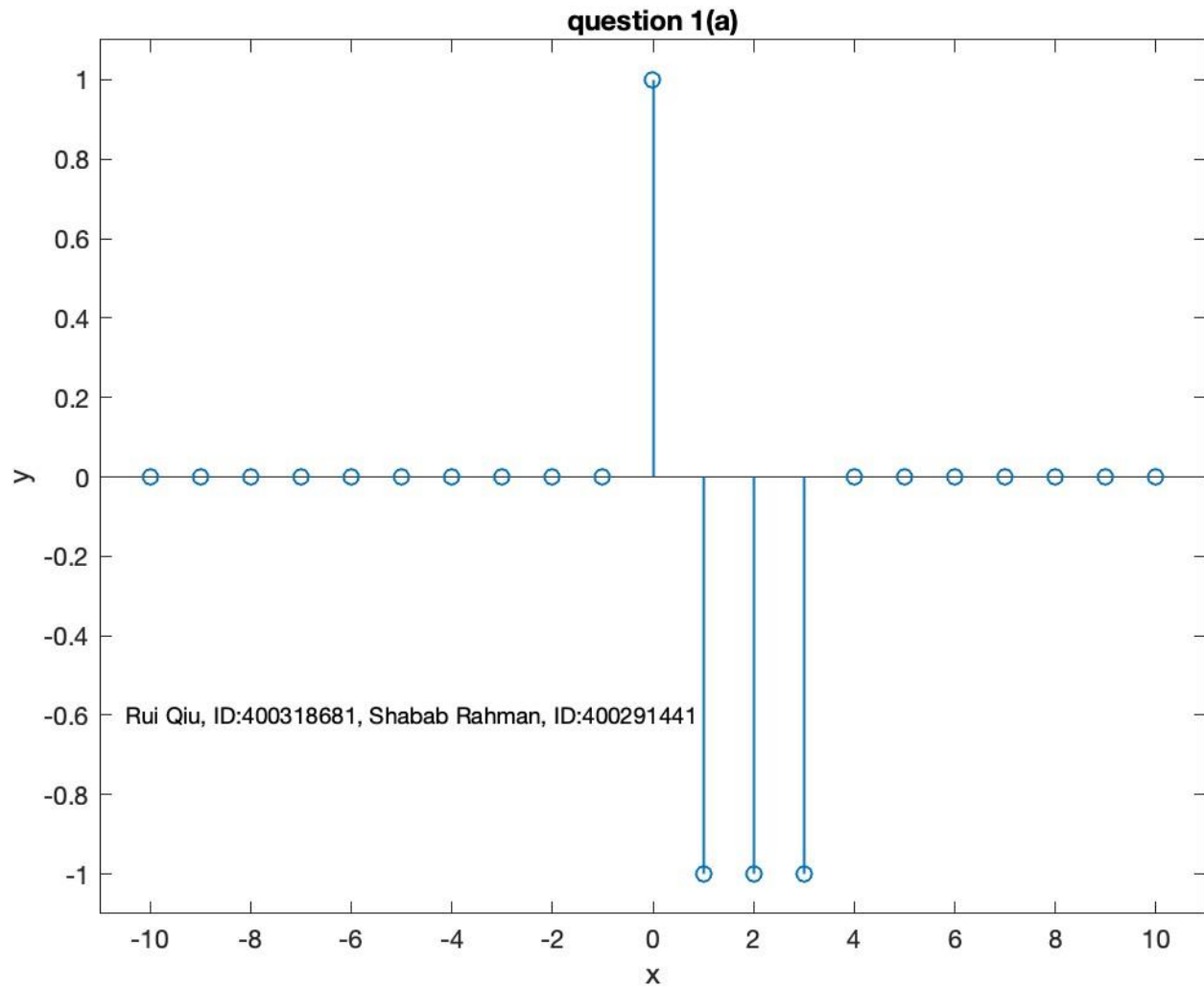
Code:

```
t = (-10:10);
f = SimpleFunctions();
a = f.unitstep(t);
b = 2 .* f.unitstep(t-1);
c = f.unitstep(t-4);
d = a - b + c;
stem(t, d, 'LineWidth', 1);

axis([min(t)-1 max(t)+1 min(d)-0.1 max(d)+0.1]);
ylabel('y');
xlabel('x');
title('question 1(a)');
text(-10.5,-0.6,'Rui Qiu, ID:400318681, Shabab Rahman, ID:400291441','FontSize',9);

exportgraphics(gcf, 'Q1a.jpg');
```

Graph:



### Q1(b)

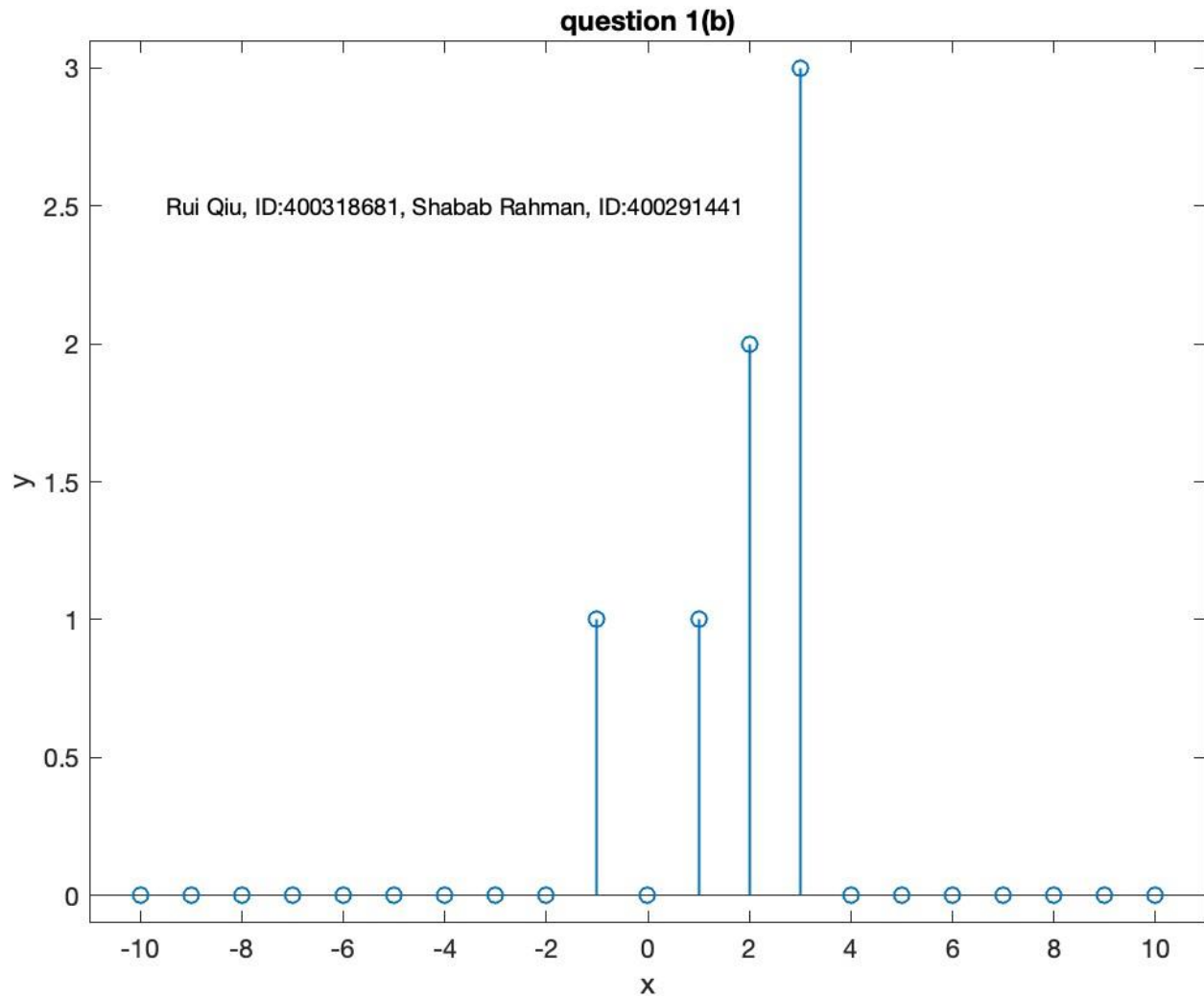
Code:

```
t = (-10:10);
f = SimpleFunctions();
a = (t+2).* f.unitstep(t+2);
b = 2 .* f.unitstep(t);
c = t .* f.unitstep(t-4);
d = a - b - c;
stem(t, d, 'LineWidth', 1);

axis([min(t)-1 max(t)+1 min(d)-0.1 max(d)+0.1]);
ylabel('y');
xlabel('x');
title('question 1(b)');
text(-9.5,2.5,'Rui Qiu, ID:400318681, Shabab Rahman, ID:400291441','FontSize',9);

exportgraphics(gcf, 'Q1b.jpg');
```

Graph:



### Q1(c)

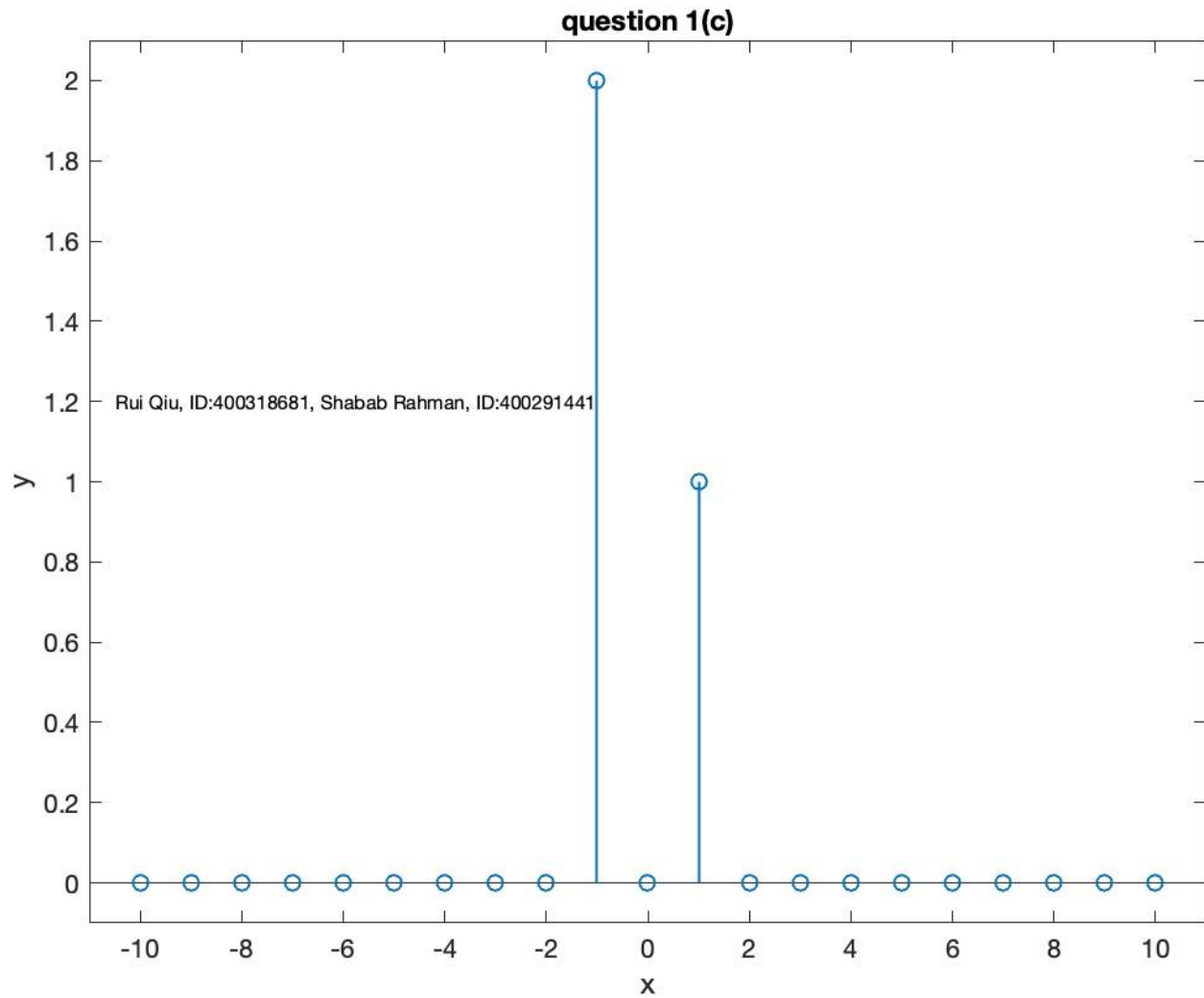
Code:

```
t = (-10:10);
f = SimpleFunctions();
a = f.delta(t+1)-f.delta(t)+f.unitstep(t+1)-f.unitstep(t-2);
stem(t, a, 'LineWidth', 1);
```

```
axis([min(t)-1 max(t)+1 min(a)-0.1 max(a)+0.1]);
ylabel('y');
xlabel('x');
title('question 1(c)');
text(-10.5,1.2,'Rui Qiu, ID:400318681, Shabab Rahman, ID:400291441','FontSize',7.5);
```

```
exportgraphics(gcf, 'Q1c.jpg');
```

Graph:



### Q1(d)

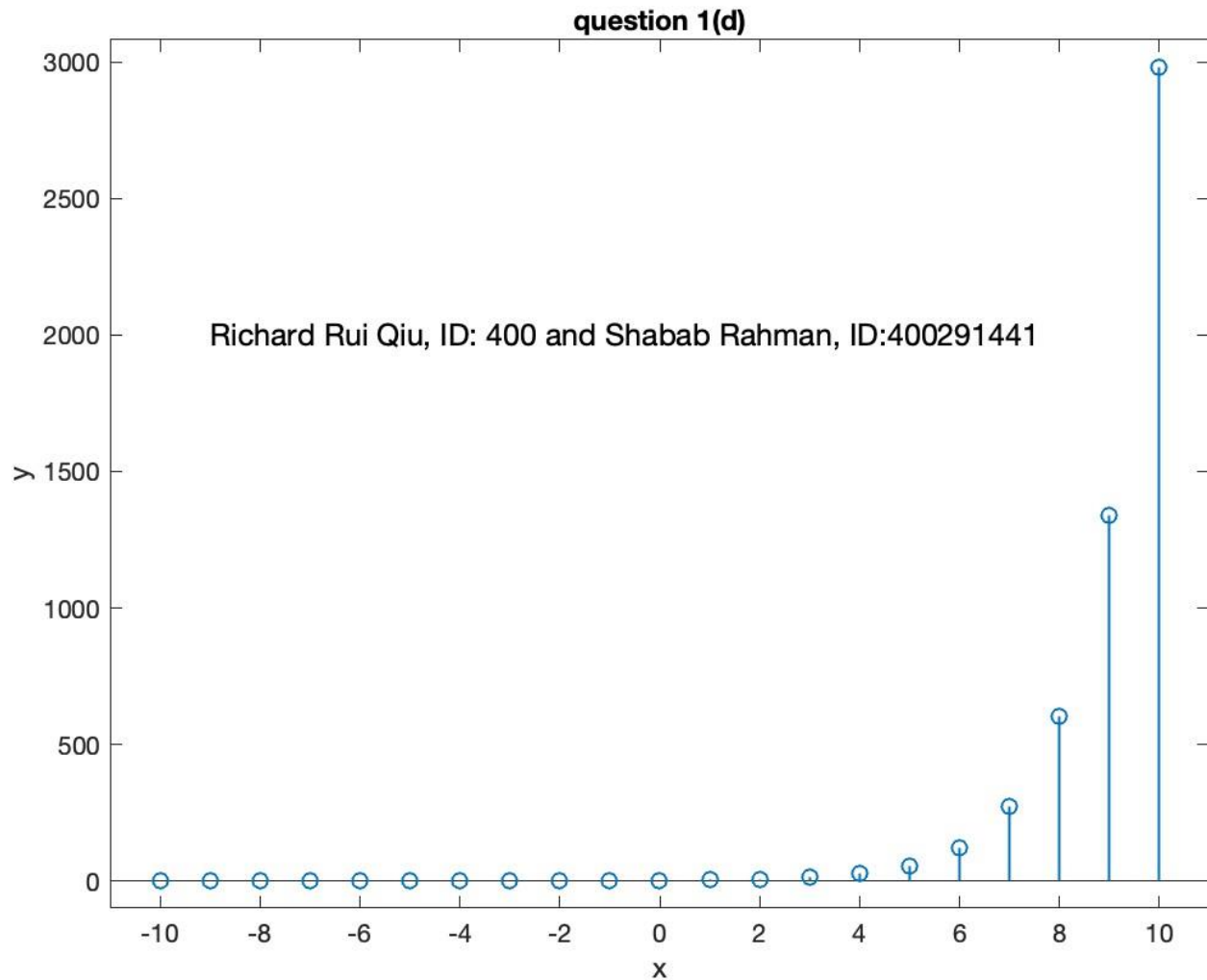
Code:

```
t = (-10:10);
f = SimpleFunctions();
a = exp(0.8 .* t) .* f.unitstep(t+1) + f.unitstep(t);

stem(t, a, 'LineWidth', 1);

stem(t, a, 'LineWidth', 1);
axis([min(t)-1 max(t)+1 min(a)-100 max(a)+100]);
ylabel('y');
xlabel('x');
title('question 1(d)');
text(-9,2000,'Richard Rui Qiu, ID: 400 and Shabab Rahman, ID:400291441','FontSize',12);

exportgraphics(gcf, 'Q1d.jpg');
Graph:
```



## Q2(a):

### Code:

```
clc
clear
opts = detectImportOptions('course_grades_2022.xlsx');
opts = setvartype(opts, {'ID_Number', 'Name'}, 'string');
table = readtable('course_grades_2022.xlsx', opts);

H = height(table); %get the total rows of table

[labname,labtotalmark]=getMaximumLabName(table,H);
fprintf('%s get the highest lab mark, the total mark is %d.\n',labname,labtotalmark);

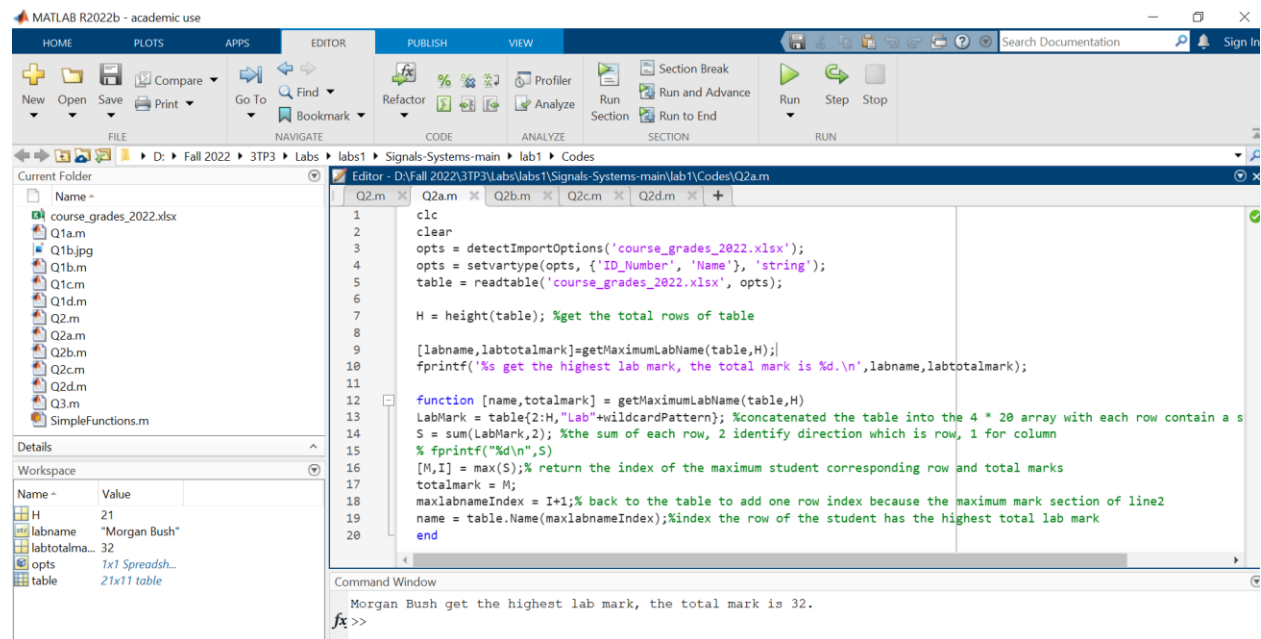
function [name,totalmark] = getMaximumLabName(table,H)
LabMark = table{2:H,"Lab"+wildcardPattern}; %concatenated the table into the 4 * 20 array with each row
contain a student lab marks
S = sum(LabMark,2); %the sum of each row, 2 identify direction which is row, 1 for column
% fprintf("%d\n",S)
```

```

[M,I] = max(S);% return the index of the maximum student corresponding row and total marks
totalmark = M;
maxlabnameIndex = I+1;% back to the table to add one row index because the maximum mark section of
line2
name = table.Name(maxlabnameIndex);%index the row of the student has the highest total lab mark
end

```

## Result:



## Q2(b):

### Code:

```

clc
clear
opts = detectImportOptions('course_grades_2022.xlsx');
opts = setvartype(opts, {'ID_Number', 'Name'}, 'string');
table = readtable('course_grades_2022.xlsx', opts);

H = height(table); %get the total rows of table

[examname,examtotalmark]=getMaximumExamName(table,H);
fprintf('%s get the highest exam mark, the total mark is %d.\n',examname,examtotalmark);

function [name,totalmark] = getMaximumExamName(table,H)
ExamMark = table(2:H,"Exam"+wildcardPattern); %concatenated the table into the 4 * 20 array with each
row contain a student lab marks
S = sum(ExamMark,2); %the sum of each row

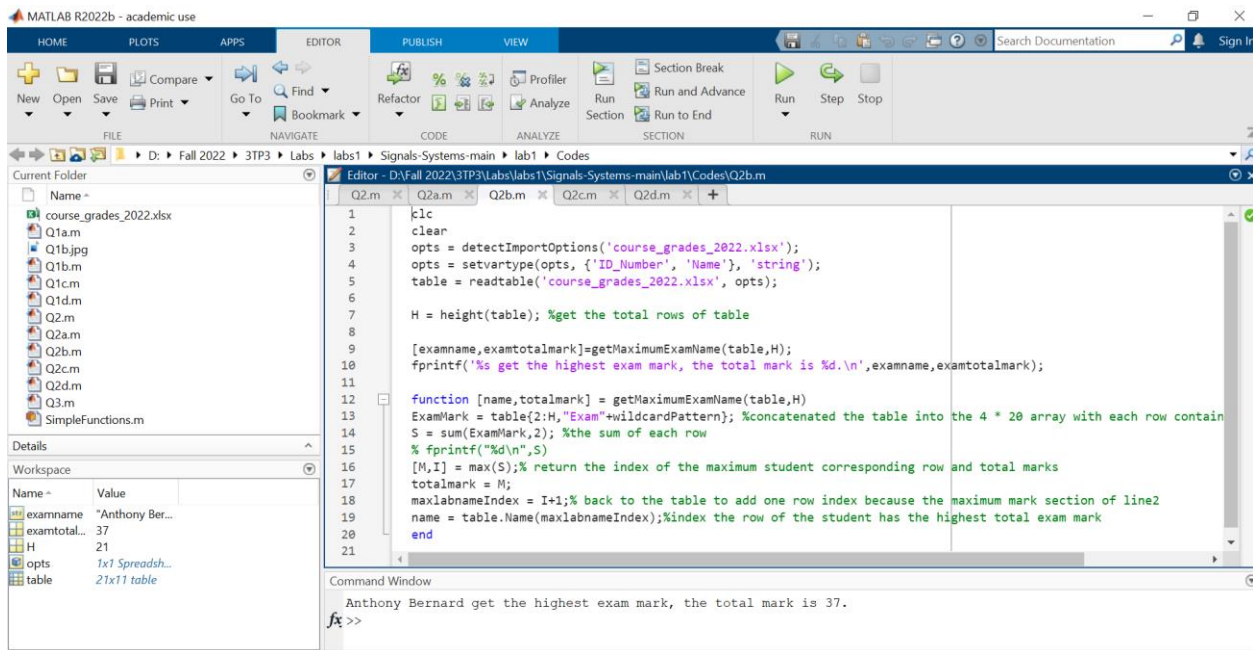
```

```

% fprintf("%d\n",S)
[M,I] = max(S);% return the index of the maximum student corresponding row and total marks
totalmark = M;
maxlabnameIndex = I+1;% back to the table to add one row index because the maximum mark section of
line2
name = table.Name(maxlabnameIndex);%index the row of the student has the highest total exam mark
end

```

## Result:



## Q2(c):

### Code:

```

clc
clear
opts = detectImportOptions('course_grades_2022.xlsx');
opts = setvartype(opts, {'ID_Number', 'Name'}, 'string');
table = readtable('course_grades_2022.xlsx', opts);

H = height(table); %get the total rows of table

[finalname,finaltotalmark]=getMaximumFinalName(table,H);
fprintf('%s get the highest fintal total mark, the total mark is %d.\n',finalname,finaltotalmark);

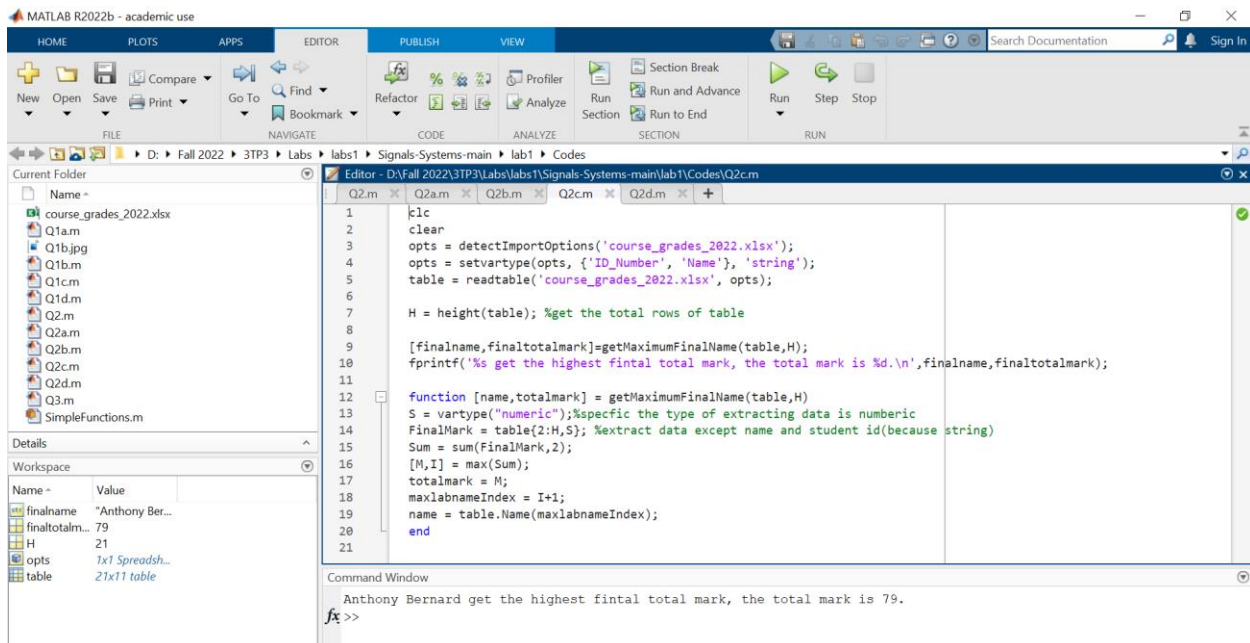
function [name,totalmark] = getMaximumFinalName(table,H)
S = vartype("numeric");%specific the type of extracting data is numeric
FinalMark = table{2:H,S}; %extract data except name and student id(because string)
Sum = sum(FinalMark,2);
[M,I] = max(Sum);

```



```
totalmark = M;
maxlabnameIndex = I+1;
name = table.Name(maxlabnameIndex);
end
```

## Result:



## Q2(d):

### Code:

```
clc
clear
opts = detectImportOptions('course_grades_2022.xlsx');
opts = setvartype(opts, {'ID_Number', 'Name'}, 'string');
table = readtable('course_grades_2022.xlsx', opts);

H = height(table); %get the total rows of table

cellPatients = {'Rui Qiu','400318681',10,10,10,10,10,10,10,10,10;
                'Shabab Rahman','400291441',10,10,10,10,10,10,10,10,10};
disp(cellPatients)
table = [table;cellPatients];
```

### Result:



```

18 cellPatients = {'Rui Qiu','400318681',10,10,10,10,10,10,10,10,10;
19                 'Shabab Rahman','400291441',10,10,10,10,10,10,10,10,10};
20 disp(cellPatients)
21 table = [table;cellPatients];
22
23 % a
24 function [name,totalmark] = getMaximumLabName(table,H)
25 LabMark = table{2:H,"Lab"+wildcardPattern}; %concatenated the table into the 4 * 20 array with each row
26 S = sum(LabMark,2); %the sum of each row, 2 identify direction which is row, 1 for column
27 % fprintf("%d\n",S)
28 [M,I] = max(S);% return the index of the maximum student corresponding row and total marks
29 totalmark = M;
30 maxlabnameIndex = I+1;% back to the table to add one row index because the maximum mark section of line
31 name = table.Name(maxlabnameIndex);%index the row of the student has the highest total lab mark

```

Command Window

Anthony Bernard get the highest final total mark, the total mark is 79.  
 Columns 1 through 9  

'Rui Qiu'	'400318681'	{[10]}	{[10]}	{[10]}	{[10]}	{[10]}	{[10]}	{[10]}
'Shabab Rahman'	'400291441'	{[10]}	{[10]}	{[10]}	{[10]}	{[10]}	{[10]}	{[10]}

 Columns 10 through 11  

{[10]}	{[10]}
{[10]}	{[10]}

Because the new table is inserted after previous function calls, so it won't affect the previous result

The output is based on the random generated table shown below.

	1 Name	2 ID_Number	3 Lab_1	4 Lab_2	5 Lab_3	6 Lab_4	7 Midterm	8 Exam_1	9 Exam_2	10 Exam_3	11 Exam_4
1	"Maximum Mark"	"0"	10	10	10	10	20	10	10	10	10
2	"Kacie Stephenson"	"1803933"	7	2	9	0	9	4	5	8	10
3	"Yassin Jordan"	"1884159"	1	2	10	3	8	3	9	5	7
4	"Lowri Mathews"	"1853847"	2	0	0	2	17	6	10	7	4
5	"Tiya Sheridan"	"1810192"	7	1	0	6	15	8	7	6	6
6	"Nikola Forrest"	"1891352"	1	7	0	6	5	0	5	5	10
7	"Veer Blair"	"1811313"	4	8	5	3	12	7	4	0	2
8	"Isabelle Mcgrath"	"1804841"	6	7	4	0	13	8	9	6	4
9	"Samir Greaves"	"1881925"	9	3	7	1	6	4	6	5	9
10	"Zander Kendall"	"1877711"	8	10	5	4	17	4	8	10	2
11	"Shahzaib Buckley"	"1830894"	4	5	7	9	8	5	7	0	6
12	"Morgan Bush"	"1855191"	9	6	7	10	1	5	7	2	8
13	"Amaan Robbins"	"1821012"	1	8	4	4	8	0	9	5	8
14	"Theodore Lawson"	"1844339"	5	7	10	7	14	9	2	2	9
15	"Ace Branch"	"1898468"	2	1	3	7	11	9	9	3	6
16	"Anthony Bernard"	"1883633"	4	1	10	8	19	10	9	9	9
17	"Tobey Bell"	"1808742"	0	10	8	2	10	9	0	8	6
18	"Jannat Cassidy"	"1863450"	1	2	4	5	10	4	5	9	3
19	"Imran Marquez"	"1830190"	2	9	1	6	17	10	0	7	5
20	"Amani Castro"	"1835544"	8	9	5	7	3	7	6	8	4
21	"Blanka Holt"	"1820930"	6	5	2	0	8	6	0	7	10
22	"Rui Qiu"	"400318681"	10	10	10	10	10	10	10	10	10
23	"Shabab Rahman"	"400291441"	10	10	10	10	10	10	10	10	10

Q3:

#### Description:

Since the red and green channel was incorrectly being scaled, so to fix this image, we need to extract the red and green channel separately and scaled them by a factor to best show the result and finally reconstructed each channel together to show the image.

#### Code:

```
clear
img = imread('ee3tp3picture2022.jpg');

red= 5.* img(:,:,1); %multiply the scaling factor of the first dimension
green= 5. * img(:,:,2); %multiply the scaling factor of the second dimension
%don't need to change
blue=img(:,:,3);

%reconstruct the image
reconstructed_image=cat(3,red,green,blue);
imshow(reconstructed_image);

%writing files
imwrite(reconstructed_image, 'my_fixed_image.jpg');
```

#### Output Image:

