Assignment 1.

11

(Q1)

	x	y	$x = X - 2013$	x^2	$x \cdot y$
	2006	100.2	-7	49	-701.4
	2008	98.3	-5	25	-491.5
	2009	87.1	-4	16	-348.4
	2011	89.2	-2	4	-178.4
	2013	88.9	0	0	0
	2014	83.5	1	1	83.5
	2015	89.1	2	4	178.2
	2016	84	3	9	252
	2017	92.3	4	16	369.2
	2018	96	5	25	480.
sum	2019	97	6	36	582.
Σ	22146	1005.6	3	185.	225.2

let the eq^n of straight line be $h_w(x) = w_0 + w_1 x$

Objective funct^n $- J(w_0, w_1) = \sum_{i=1}^{n} (w_0 + w_1 x_i - y_i)^2$

$\frac{\partial J}{\partial w_0} = 0, \quad \frac{\partial J}{\partial w_1} = 0$; we get.

$$\Sigma y = w_0 n + w_1 \Sigma x \quad -(1)$$

$$\Sigma xy = w_0 \Sigma x + w_1 \Sigma x^2 \quad -(2)$$

Substituting the values we get.

$$1005.6 = w_0 11 + w_1 3 \quad -(3) \quad \times 3$$

$$225.2 = 3 w_0 + 185 w_1 \quad -(4) \quad \times 11$$

$$w_0 = 91.5$$

$$w_1 = -0.266$$

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~~for X = 2021 , x = 2021 - 2013 = 8~~

The equation is $\boxed{y = 91.5 - 0.266x}$

for

$X = 2021$, $x = 2021 - 2013 = 8$.

$$y = 91.5 - 0.266(8)$$
$$y = 89.372$$

For 2021, 89.372 billion rupees will be revenue

Q2) Taking ML as independent variable (X)

x	y	x^2	x.y
85	82	7225	6970
90	88	8100	7920
93	96	8649	8928
65	72	4225	4680
87	91	7569	7917
71	80	5041	5680
98	95	9604	9310
68	72	4624	4896
84	89	7056	7476
87	84	7569	7308
Σsum 828	849	69662	71085

The eq^{n}'s are:

$$\Sigma y = n w_0 + w_1 \Sigma x$$
$$\Sigma xy = w_0 \Sigma x + w_1 \Sigma x^2$$

$$849 = 10 w_0 + 828 w_1$$
$$71085 = 828 w_0 + 69662 w_1$$

solving, we get, $w_0 = 25.79$

$$w_1 = 0.7138 \approx 0.71$$

(a) The eq^{n} is $y = 25.79 + 0.71x$

(c) $x = 96$, $y = 25.79 + 0.71(96)$

$x = 96 \quad y = 93.95$

(b) Taking HVR as independent variable (X)

X	Y	x^2	x.y
82	85	6724	6970
88	90	7744	7920
96	93	9216	8928
72	65	5184	4680
91	87	8281	7917
80	71	6400	5680
95	98	9025	9310
72	68	5184	4896
89	84	7921	7476
84	87	7056	7308
Σ sum	849	828	72735	71085

The eq's are :-

$$\Sigma y = n w_0 + \Sigma x w_1$$
$$\Sigma xy = w_0 \Sigma x + w_1 \Sigma x^2$$

Substituting values we get:

$$10 w_0 + 849 w_1 = 828 \quad \text{—(1)}$$
$$849 w_0 + 72735 w_1 = 71085 \quad \text{—(2)}$$

Solving both we get.

$$w_0 = -19.32$$
$$w_1 = 1.202$$

The eq^n is $\boxed{y = -19.32 + 1.202x}$

(d) if $x = 95$ (marks in HUR) $y = -19.32 + 1.202(95)$

$\boxed{x = 95 \qquad y = 94.87.}$

Q3)

P	61.2	49.5	37.5	28.4	19.2	10.1
V	54.3	61.8	72.4	88.7	118.6	194

$PV^n = C$

$\log P + n \log V = \log C$

$y \quad x$

let $y = \log P$

$x = \log V$.

~~$y = \log C - n \log$~~

$\log P = -n \log V + \log C$

$y = \log C - nx$

x	y	x^2	x·y
1.734	1.786	3.0068	3.0969
1.79	1.694	3.2041	3.0323
1.859	1.574	3.4559	2.9261
1.947	1.453	3.79081	2.829
2.074	1.283	4.3015	2.6609
2.287	1.004	5.2304	2.2961
Σx 11.691	8.794	22.9894	16.8413

The eq^{n}s are.

$\Sigma y = 6 \log C - n \Sigma x$ — (1)

$\Sigma xy = \log C (\Sigma x) - n \Sigma x^2$ — (2).

$6 \log c - n\, 11.691 = 8.794$ — (1)

$11.691 \log c - n(22.9894) = 16.8413$ — (2)

Solving we get,

$\log c = 4.198$

and $n = 1.4025$.

(a) $c = \text{antilog}(4.198) = 10^{4.198}$

$$c = 15776.127$$

$$n = 1.4025$$

(b) $PV^{1.4025} = 15776.127$ is the eqn.

(c) when $V = 100$

$P(100)^{1.4025} = 15776.127$

$$P = 24.71$$

Q4)

	x	Y	x^2	$x \cdot y$	x^3	x_4	$x^2 \cdot y$
	0	2.4	0	0	0	0	0
	1	2.1	1	2.1	1	1	2.1
	2	3.2	4	6.4	8	16	12.8
	3	5.6	9	16.8	27	81	50.4
	4	9.3	16	37.2	64	256	148.8
	5	14.6	25	73	125	625	365
	6	21.9	36	131.4	216	1296	788.4
Σ	21	59.1	91	266.9	441	2275	1367.5

$$y = w_0 + w_1 x + w_2 x^2$$

$$\Sigma y = w_0 n + w_1 \Sigma x + w_2 \Sigma x^2 \quad \text{— (1)}$$

$$\Sigma xy = w_0 \Sigma x + w_1 \Sigma x^2 + w_3 \Sigma x^3 \quad \text{— (2)}$$

$$\Sigma x^2 y = w_0 \Sigma x^2 + w_1 \Sigma x^3 + w_3 \Sigma x^4 \quad \text{— (3)}$$

$$7w_0 + 21w_1 + 91w_2 = 59.1$$

$$21w_0 + 91w_2 + 441w_3 = 266.9$$

$$91w_0 + 441w_2 + 2275w_3 = 1367.5.$$

solving, we get,

$$w_0 = 2.509$$
$$w_1 = -1.20$$
$$w_2 = 0.733$$

The equation of parabola is:

$$y = 2.509 - 1.2x + 0.733x^2$$

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D: ▸ data for Q5

Current Folder

Name

india_covid19.csv

Question 5.xlsx

Details

Select a file to view details

Command Window

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```
>> scatter(date,noOfDeaths)
>>
```

Figure 1

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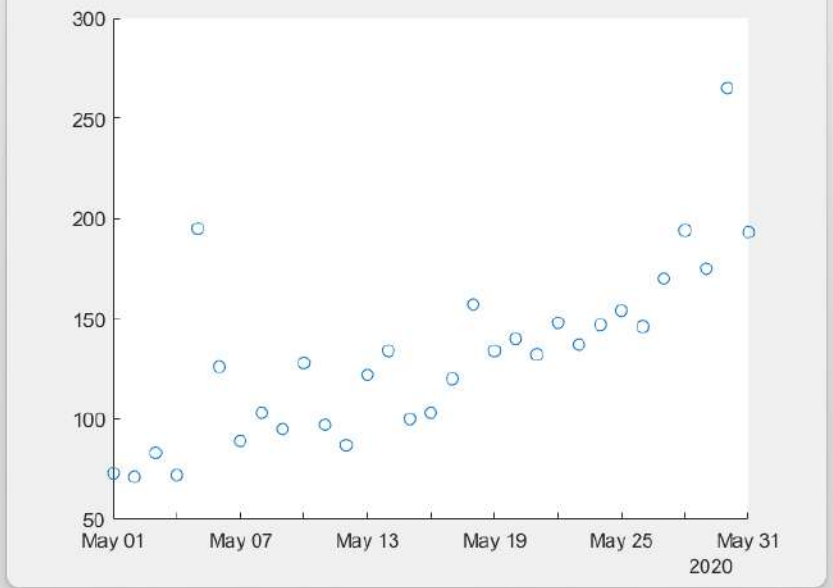

Workspace

Name	Value
date	32x1 datetime
noOfDeaths	32x1 double

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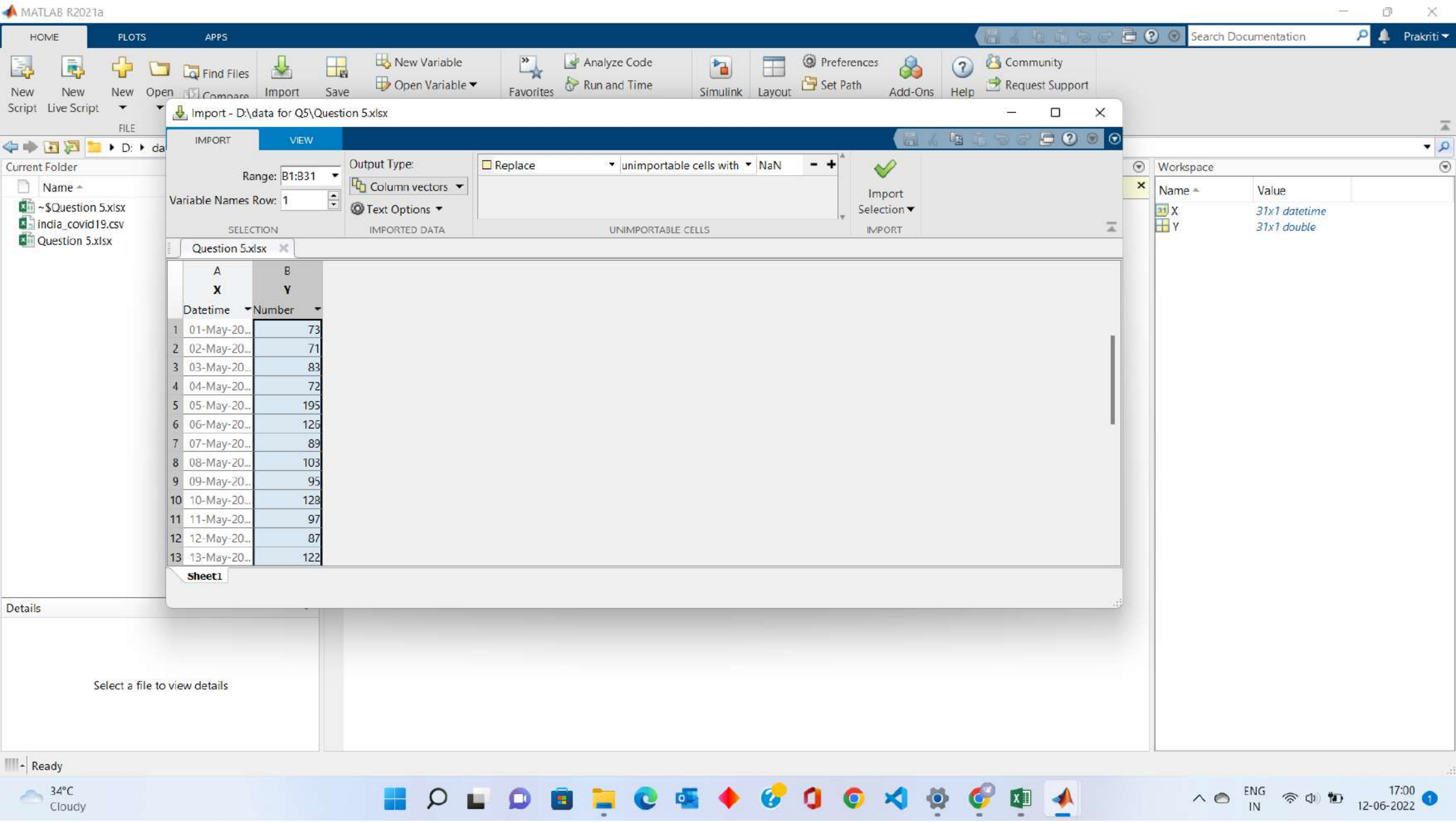
16:57 12-06-2022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FILE
Import - D:\data for Q5\Question 5.xlsx
IMPORT
VIEW
Range: B1:B31
Variable Names Row: 1
SELECTION
Output Type:
Column vectors
Text Options
IMPORTED DATA
Replace
unimportable cells with
NaN
UNIMPORTABLE CELLS
Import Selection
IMPORT
Question 5.xlsx
A
X
Datetime
B
Y
Number
1 01-May-20... 73
2 02-May-20... 71
3 03-May-20... 83
4 04-May-20... 72
5 05-May-20... 195
6 06-May-20... 126
7 07-May-20... 89
8 08-May-20... 103
9 09-May-20... 95
10 10-May-20... 128
11 11-May-20... 97
12 12-May-20... 87
13 13-May-20... 122
Sheet1
Current Folder
Name
~$Question 5.xlsx
india_covid19.csv
Question 5.xlsx
Details
Select a file to view details
Workspace
Name
Value
X
31x1 datetime
Y
31x1 double
Ready
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Cloudy
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india_covid19.csv
Question 5.xlsx

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```
>> scatter(X,Y)
>>
```

Figure 1

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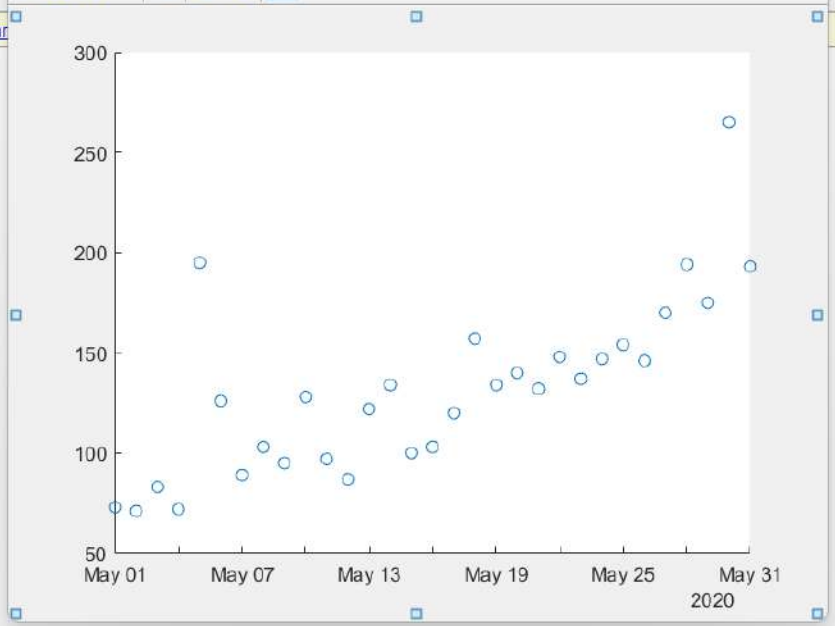

Workspace

Name	Value
X	31x1 datetime
Y	31x1 double

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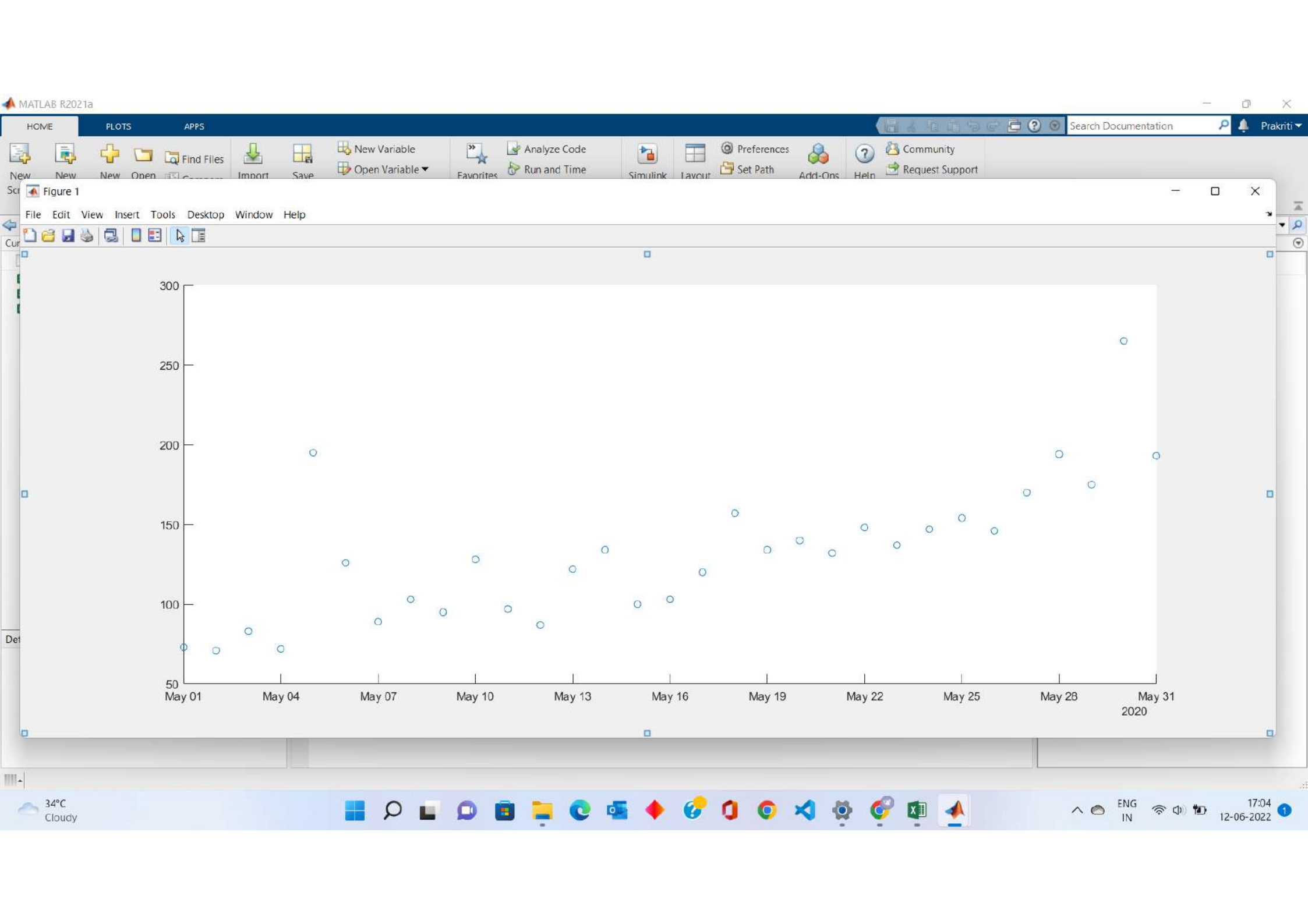
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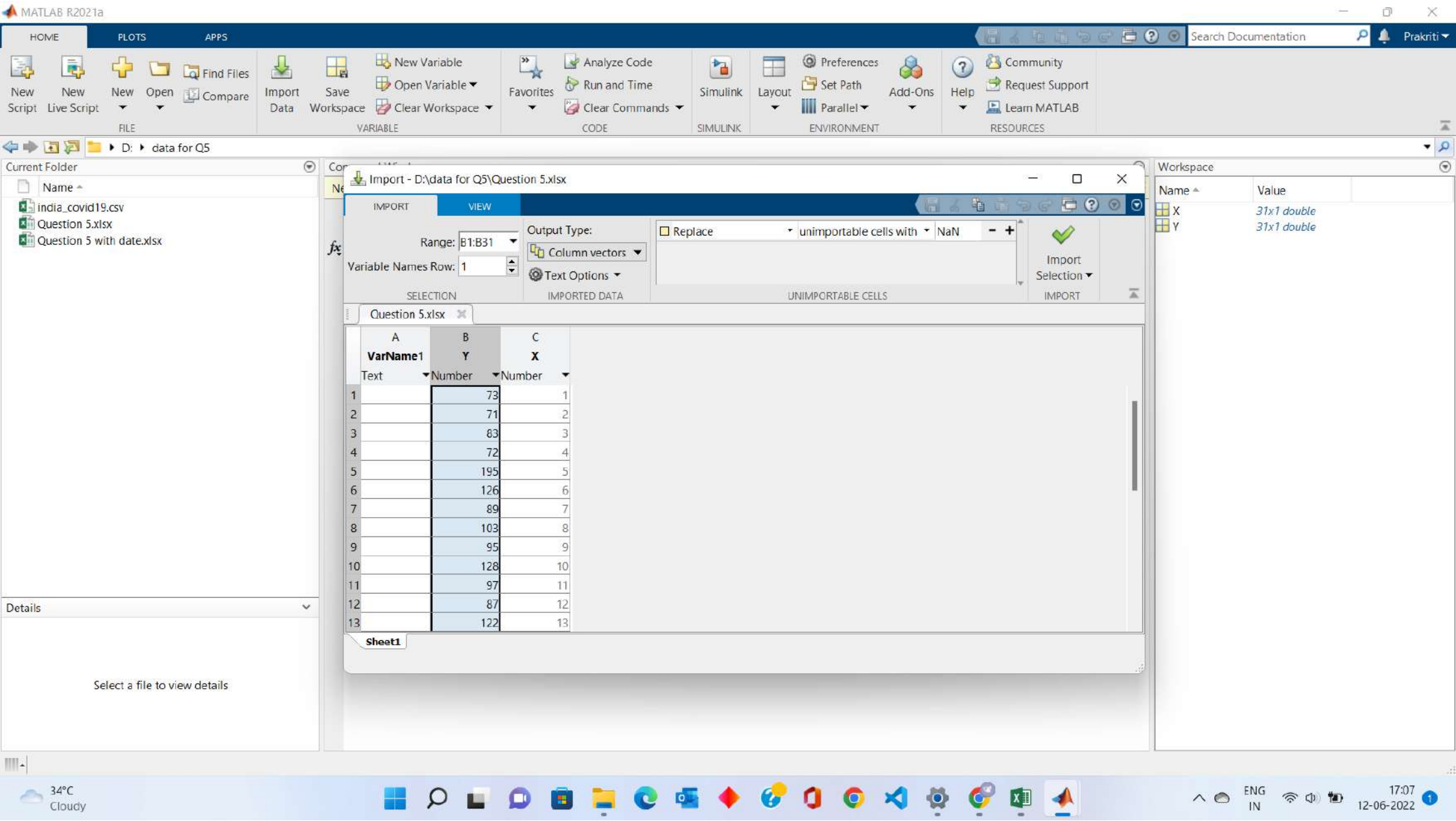
300
250
200
150
100
50
May 01
May 04
May 07
May 10
May 13
May 16
May 19
May 22
May 25
May 28
May 31
2020
34°C
Cloudy
ENG
IN
17:04
12-06-2022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D: ▸ data for Q5
Current Folder
Name
india_covid19.csv
Question 5.xlsx
Question 5 with date.xlsx
Details
Select a file to view details
Import - D:\data for Q5\Question 5.xlsx
IMPORT
VIEW
Range: B1:B31
Variable Names Row: 1
SELECTION
Output Type:
Column vectors
Text Options
IMPORTED DATA
Replace
unimportable cells with
NaN
UNIMPORTABLE CELLS
Import Selection
IMPORT
Question 5.xlsx
A
VarName1
Text
B
Y
Number
C
X
Number
1 73 1
2 71 2
3 83 3
4 72 4
5 195 5
6 126 6
7 89 7
8 103 8
9 95 9
10 128 10
11 97 11
12 87 12
13 122 13
Sheet1
Workspace
Name
Value
X
31x1 double
Y
31x1 double
34°C
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D: ▸ data for Q5

Current Folder

Name

india_covid19.csv
Question 5.xlsx
Question 5 with date.xlsx

Details

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Command Window

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```
>> scatter(X,Y)
>> clear
>> scatter(X,Y)
>> scatter(X,Y)
```

Workspace

Name	Value
X	31x1 double
Y	31x1 double

Figure 1

File Edit View Insert Tools Desktop Window Help

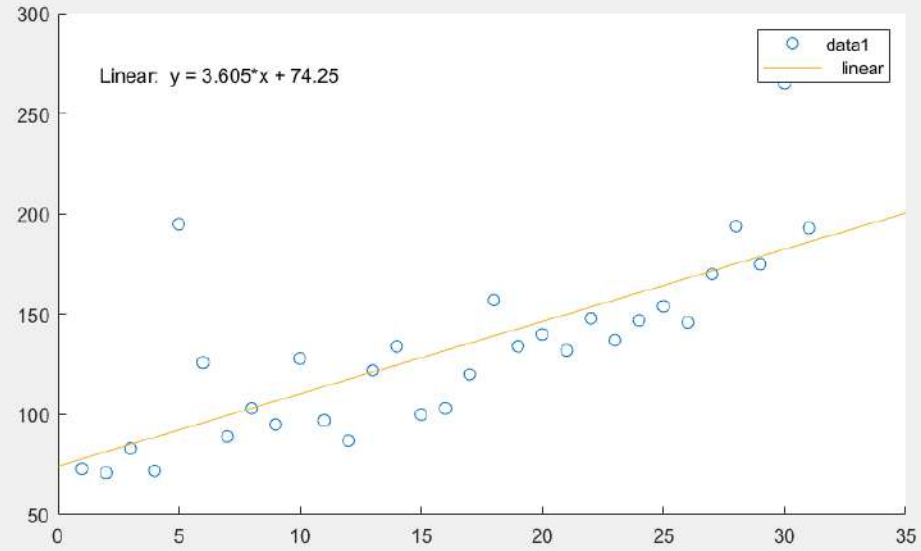

Figure 1: Basic Fitting

Data: data1 — Center and scale x-axis data

TYPES OF FIT

- [x] Linear
- [ ] Quadratic
- [ ] Cubic
- [ ] Spline interpolant
- [ ] 4th degree polynomial
- [ ] 5th degree polynomial

FIT RESULTS

Significant digits: 4

Linear

Equation	$y = 3.605x + 74.25$
R^2	0.5648
Norm of residuals	157.6

ERROR ESTIMATION (RESIDUALS)

INTERPOLATE / EXTRAPOLATE DATA

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D: ▸ data for Q5

Current Folder

Name
- india_covid19.csv
- Question 5.xlsx
- Question 5 with date.xlsx

Details

Command Window

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```
>> scatter(X,Y)
>> clear
>> scatter(X,Y)
>> scatter(X,Y)
```

Workspace

Name	Value
X	31x1 double
Y	31x1 double

Figure 1

File Edit View Insert Tools Desktop Window Help

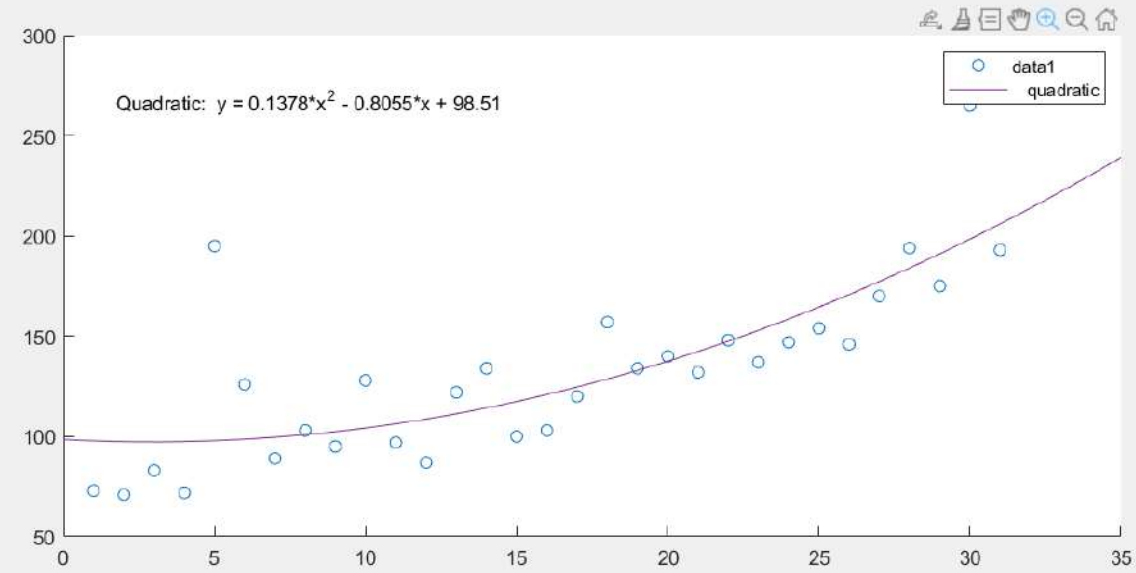

Figure 1: Basic Fitting

Data: data1 | Center and scale x-axis data

TYPES OF FIT

- Linear
- Quadratic
- Cubic
- Spline interpolant
- 4th degree polynomial
- 5th degree polynomial

FIT RESULTS

Significant digits: 4

Quadratic

Equation	$y = 0.1378x^2 - 0.8055x + 98.51$
R^2	0.6175
Norm of residuals	147.8

ERROR ESTIMATION (RESIDUALS)

INTERPOLATE / EXTRAPOLATE DATA

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