ASSIGNMENT:-06

EECE:-212

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Level: 2

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Here are some mathematical problem are solved by MATLAB 2020a.according to the questions. The answers are given bellow:

Numerically evaluate the following integrals with

i) **Trapezoid Method**
ii) **Simpson's 1/3 Rule**
iii) **Simpson's 3/8 Rule**

a) $I = \int_0^9 \frac{xdx}{x^2+4}$

b) $y = f(x)$ **such that some coordinate pairs are given by-(x, y) = (1,-15.997) , (1.5, -17.966), (2,-19.808), (2.5, -21.267), (3, -21.813), (3.5, -20.458), (4,-15.712), (4.5, -5.089), (5,14.875), (5.5, 49.042), (6,103.968), (6.5,188.257), (7, 312.947)**

Compare the results with analytical integrals. For the first integral, comment on the accuracy of the result with variation of h (distance between two x coordinates). For both integrals, compare the accuracy of the 3 methods you used.

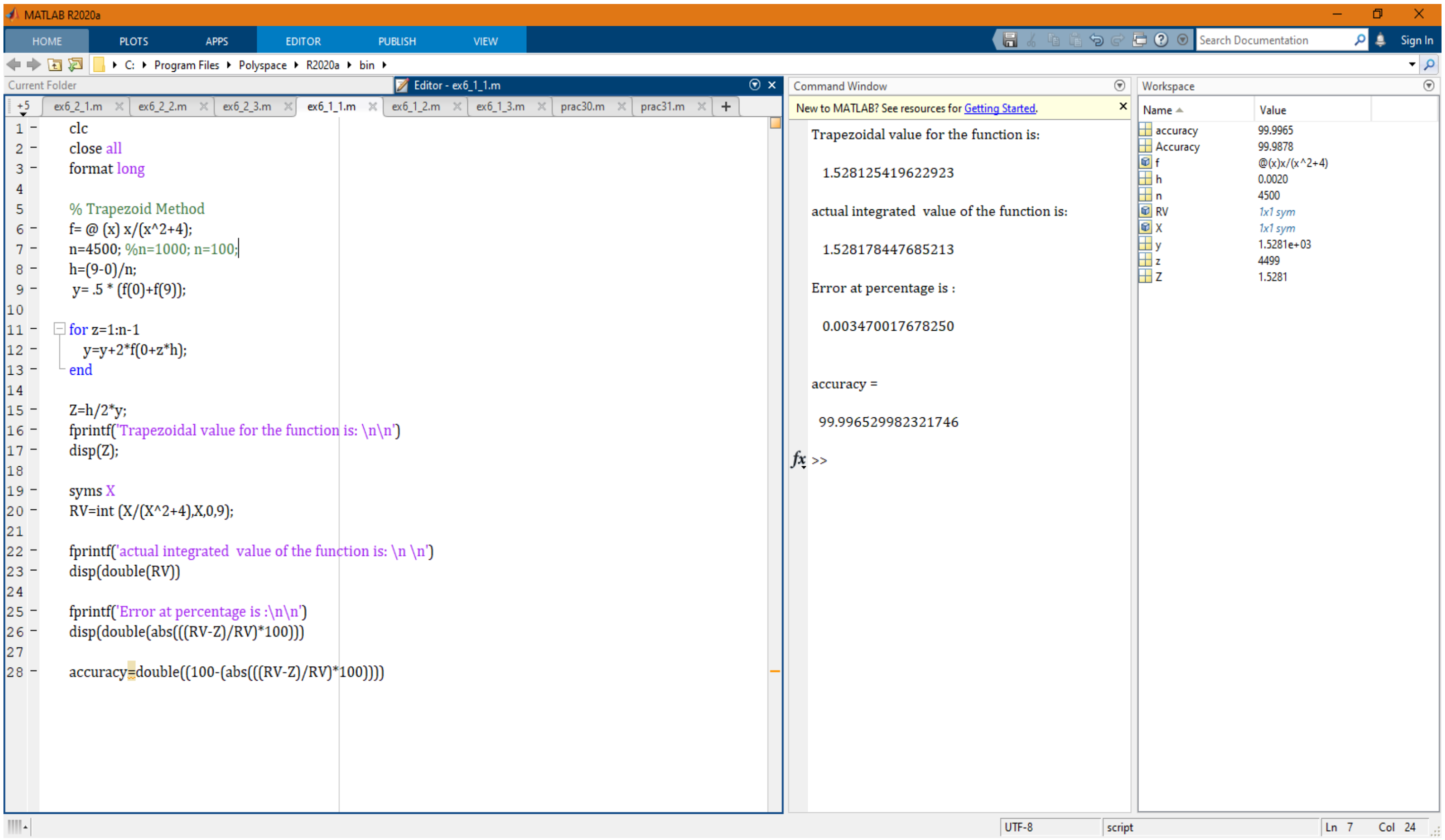
Solution:

Here have to find out the integrated value for 2 types of math by three methods, and also have to compare the accuracy of the three methods used. The program is given bellow.

a) $I = \int_0^9 \frac{xdx}{x^2+4}$

Is solved in three methods,

Trapezoid Method:



Here,

Trapezoidal value for the function is:

1.528125419622923

Actual integrated value of the function is:

1.528178447685213

Error at percentage is:

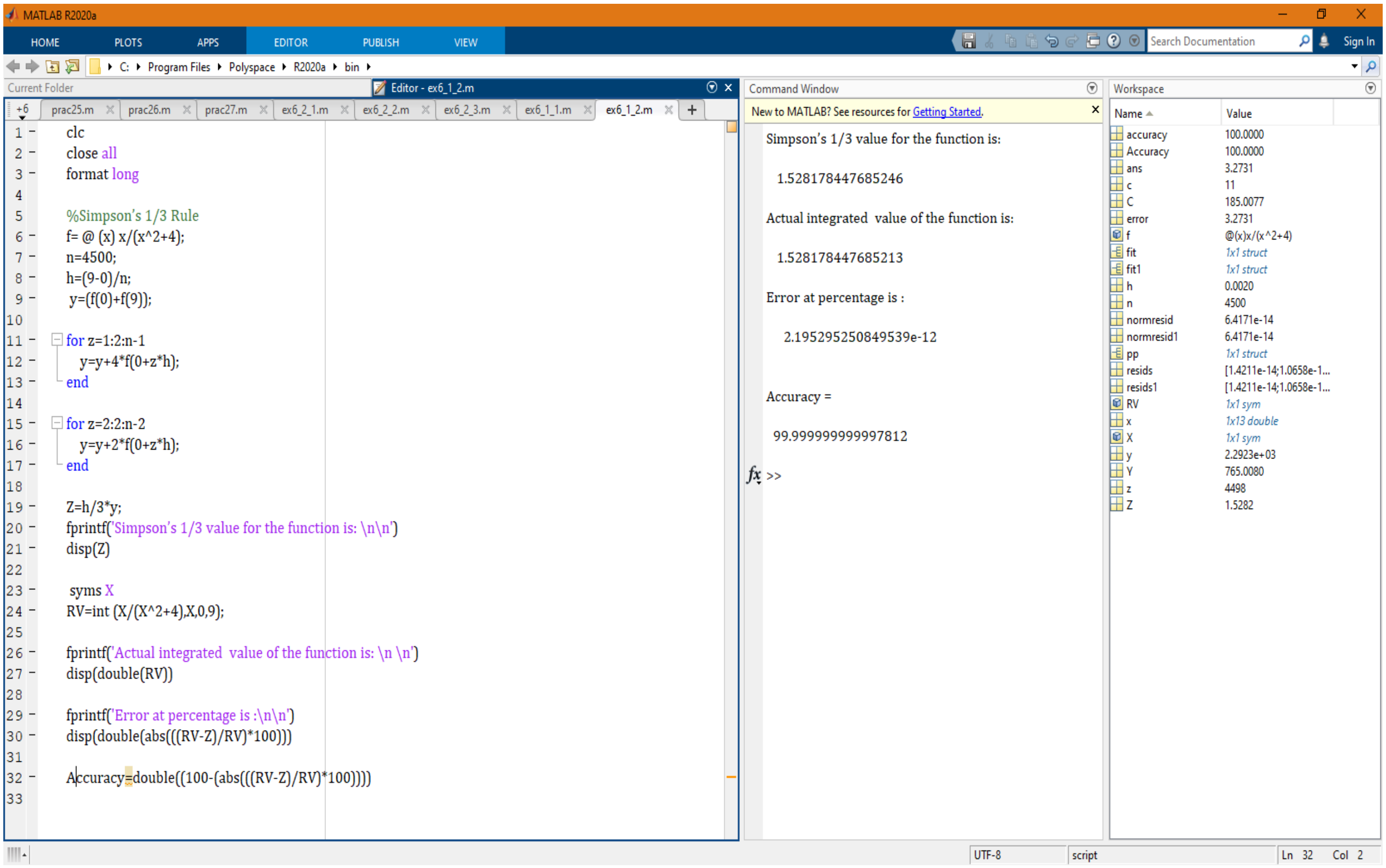
0.003470017678250%

Accuracy =

99.996529982321746%

And the more the value of **h** increase. The more the error is increase. So I put **n=4500**. Which make the value of h more **miniature**.

Simpson’s 1/3 Rule:



Here,

Simpson’s 1/3 value for the function is:

1.528178447685246

Actual integrated value of the function is:

1.528178447685213

Error at percentage is:

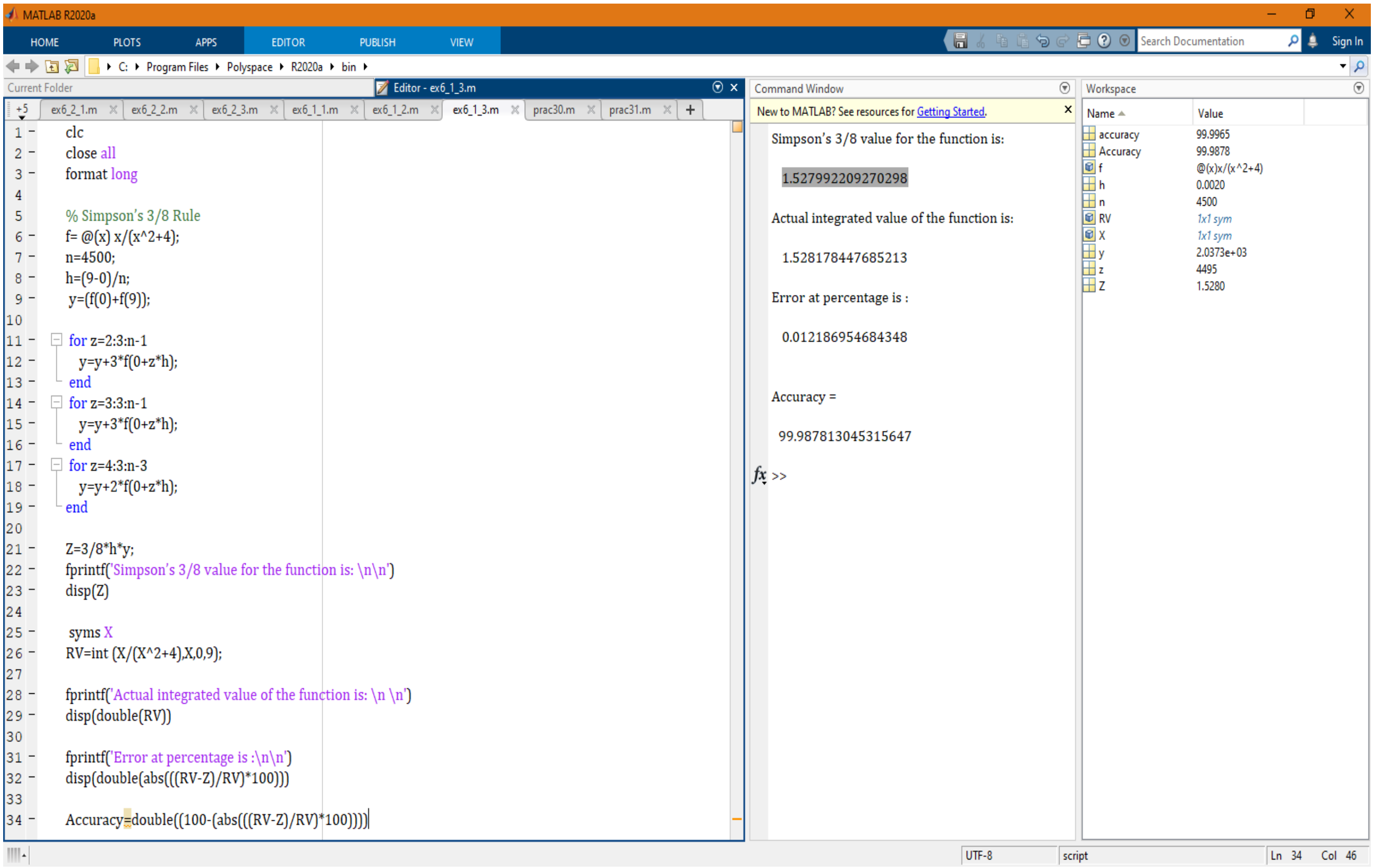
2.195295250849539e-12%

Accuracy =

99.999999999997812%

And the more the value of **h** increase. The more the error is increase. So I put **n=4500**. Which make the value of h more **miniature**.

Simpson’s 3/8 Rule:



Here,

Simpson’s 3/8 value for the function is:

1.527992209270298

Actual integrated value of the function is:

1.528178447685213

Error at percentage is:

0.012186954684348%

Accuracy:

99.987813045315647%

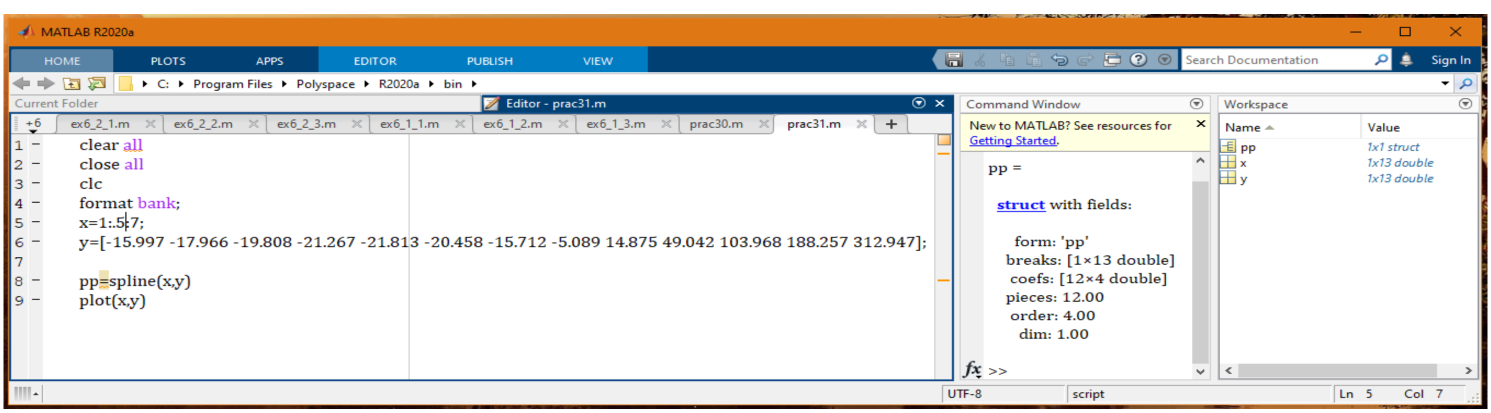
And the more the value of **h** increase. The more the error is increase. So I put **n=4500**. Which make the value of h more **miniature**.

Comment:

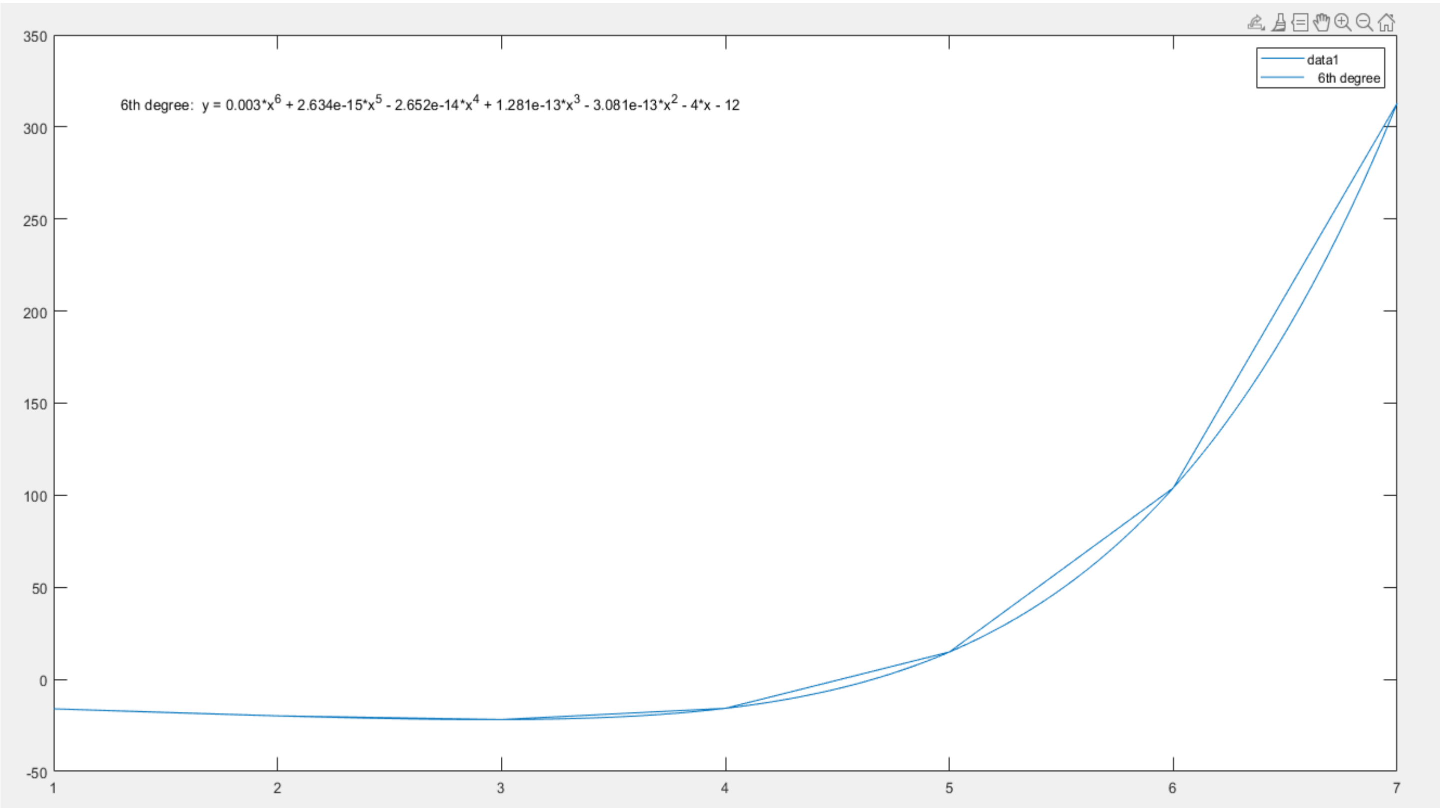
All are much accurate. Because the value of h is too small. If I increase the value of h its accuracy will decrease. To compare these method I can say that "Simpson's 1/3 Rule**" has most accuracy among them**.

(b) $y = f(x)$ Such that some coordinate pairs are given by-(x, y) = (1,-15.997), (1.5, -17.966), (2,-19.808), (2.5, -21.267), (3, -21.813), (3.5, -20.458), (4,-15.712), (4.5, -5.089), (5, 14.875), (5.5, 49.042), (6,103.968), (6.5, 188.257), (7, 312.947)

Here to calculate the accuracy, **we need an equation**. So **I plot the values** and **will get an equation** from the basic fitting of the graph.



The graph according the value is:



The equation is:

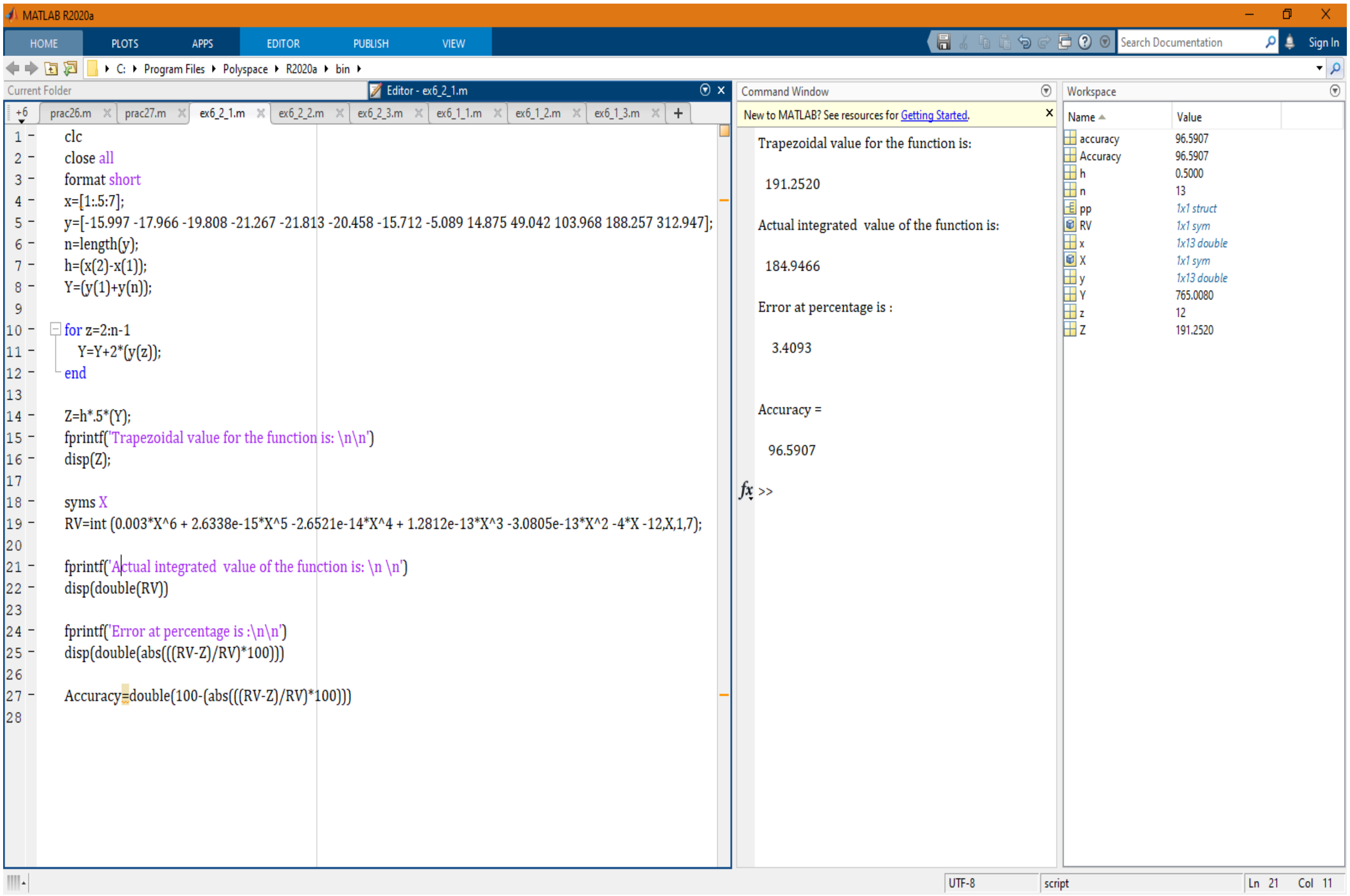
y = 0.003*x^6 + 2.6338e-15*x^5 -2.6521e-14*x^4 + 1.2812e-13*x^3 -3.0805e-13*x^2 -4*x -12

Now again the equation is solves by three methods. These are:

i) Trapezoid Method
ii) Simpson's 1/3 Rule
iii) Simpson's 3/8 Rule

The programs are given bellow:

Trapezoid Method:



Here,

Trapezoidal value for the function is:

191.2520

Actual integrated value of the function is:

184.9466

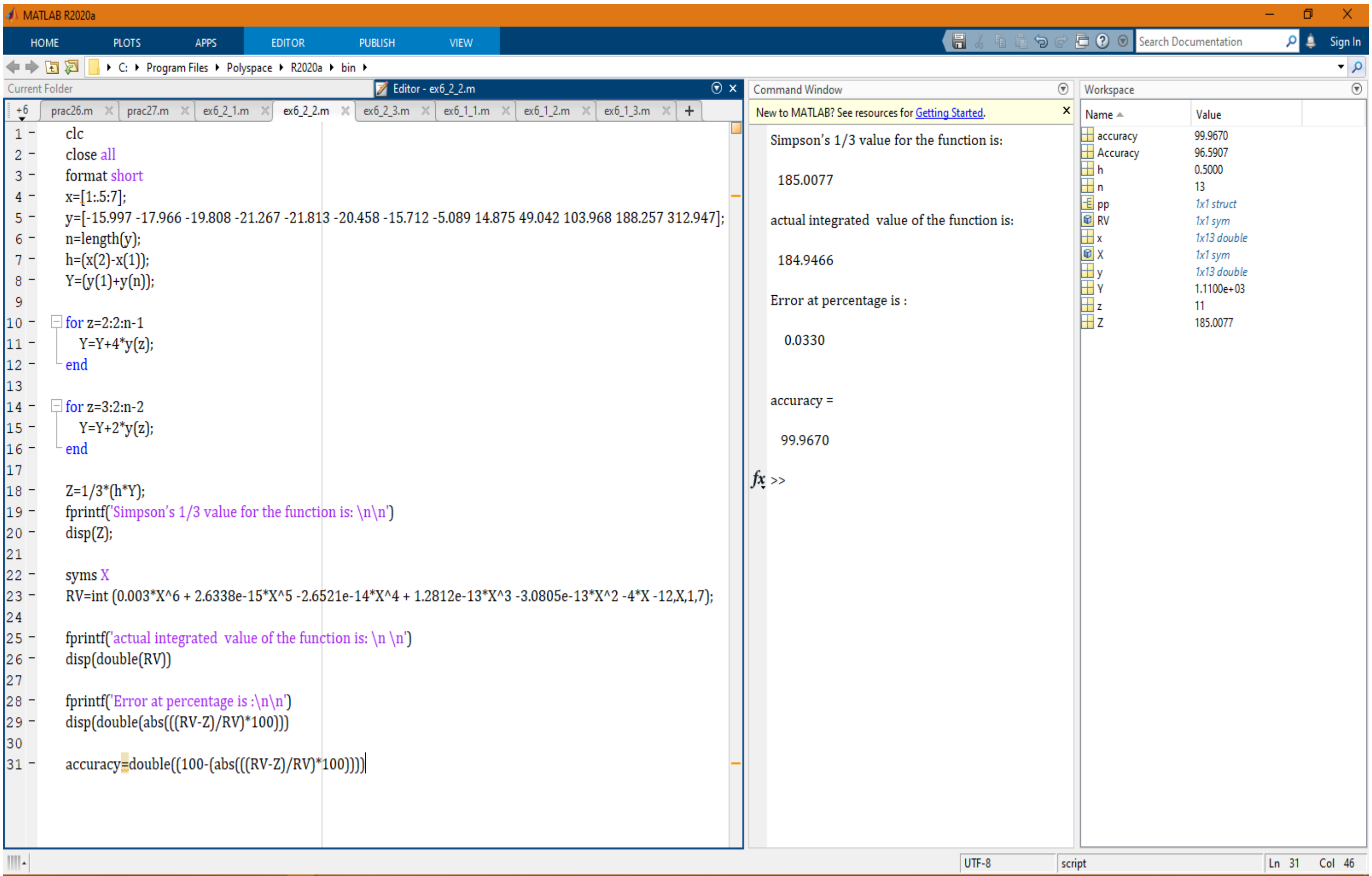
Error at percentage is:

3.4093%

Accuracy =

96.5907%

Simpson’s 1/3 Rule:



Here,

Function Simpson’s 1/3 value for the is:

185.0077

Actual integrated value of the function is:

184.9466

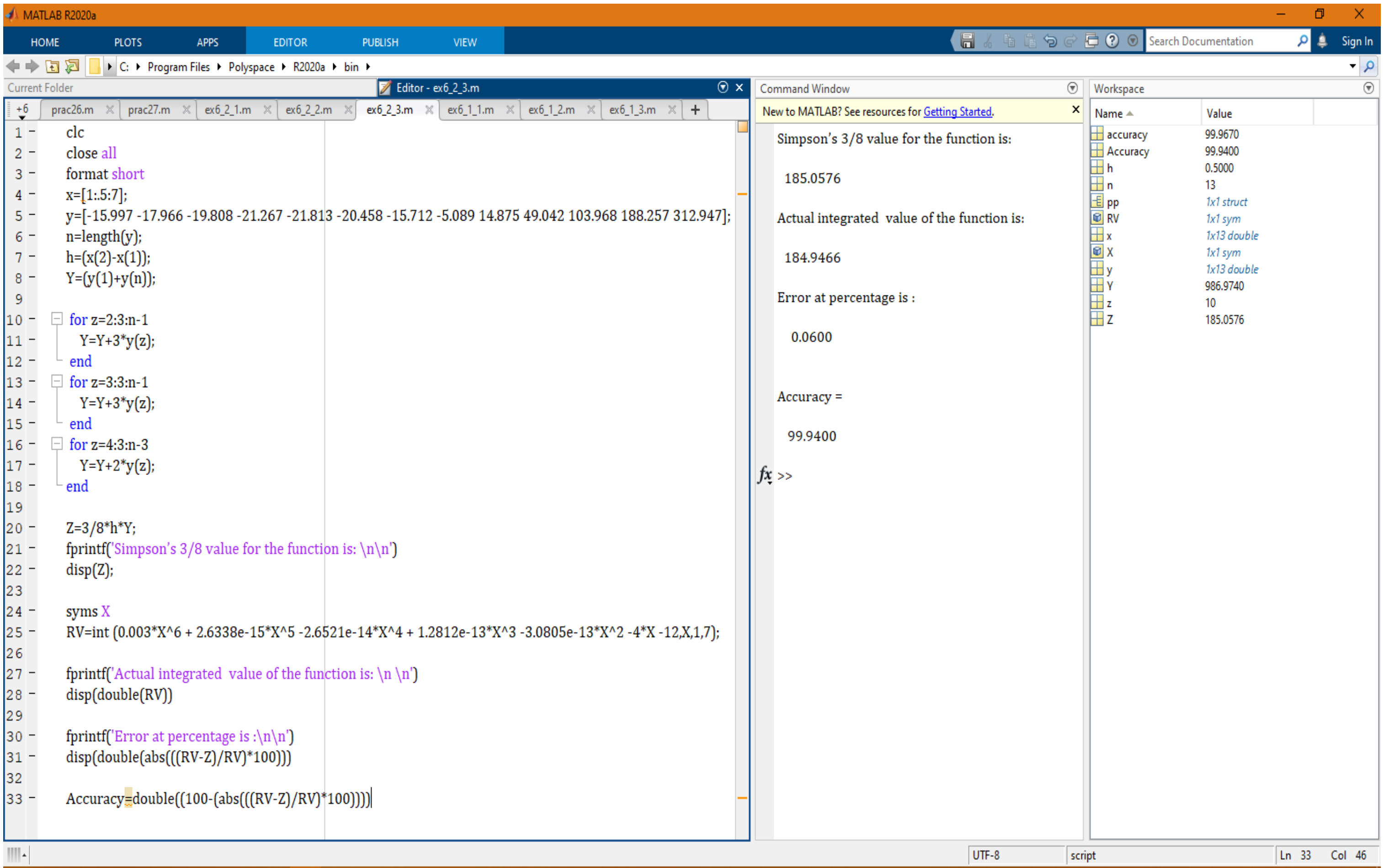
Error at percentage is:

0.0330%

Accuracy:

99.9670%

Simpson’s 3/8 Rule:



Here,

Simpson’s 3/8 value for the function is**:**

185.0576

Actual integrated value of the function is:

184.9466

Error at percentage is:

0.0600%

Accuracy:

99.9400%

<u>Comment:</u>

**** To compare these method I can say that again “Simpson’s 1/3 Rule” has most accuracy among them. ****