



Handout 12

MATH 140 Lab: Section 1

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Student's Name:-----

Student's ID:-----

Note: This handout gives you just an introduction about how to use Maple software for numerical integration.

The Basic Steps to get started with MAPLE SOFTWARE:

First Step: Please go to MyMath website: <http://www.my.math.wsu.edu>

Second Step: Use your WSU username (firstname.lastname) as ID Network, and use your MyWSU password to login to MyMath website.

Third Step: Use your WSU username (firstname.lastname) as ID Network, and use your MyWSU password to login to MyMath website.

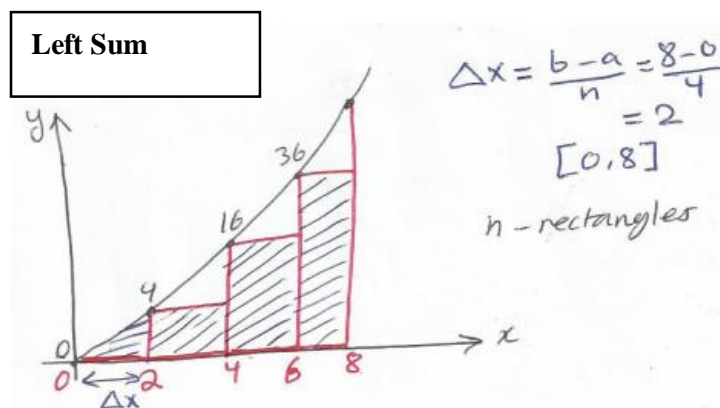
Fourth Step: Click on “Go To...” at the left top of the MyMath website, and then select “Software”.

Fifth Step: Choose “Maple”.

Sixth Step: You can now type Maple commands in the given text region, and then click on the “Run Maple” button.

Numerical Integration with MAPLE SOFTWARE:

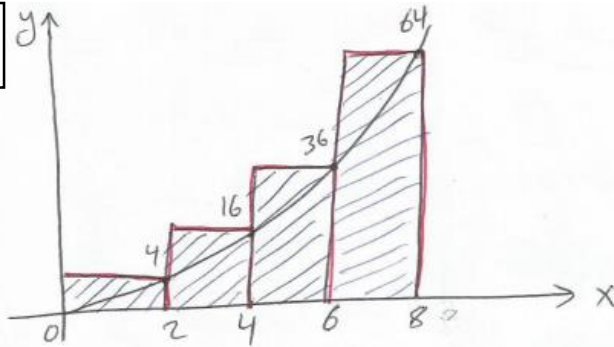
Example 1: Calculate the area bounded by the graph of $f(x) = x^2$ and x - axis, between $x = 0$ and $x = 8$ for 4 sub-intervals using Riemann Sum and MAPLE software.

Solution:

Riemann Sum
for 4 sub-intervals

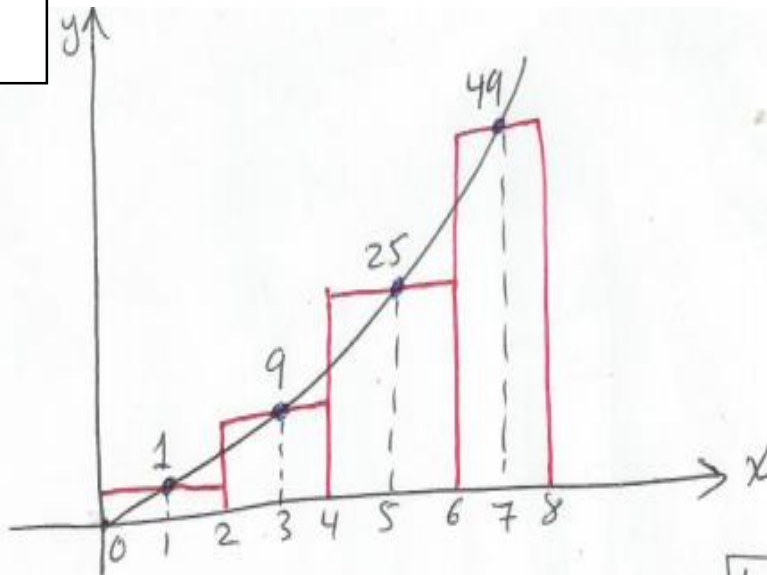
$$R_4 = \sum_{i=1}^4 f(x_i) \Delta x = (2)(0) + (2)(4) + (2)(16) + 2(36) = \boxed{110}$$

Right Sum



$$R_4 = (2)(4) + (2)(16) + (2)(36) + (2)(64) = \boxed{236}$$

Midpoint
Rule



$$R_4 = (2)(1) + (2)(9) + (2)(25) + (2)(49) = \boxed{168}$$

Now, let's use *MAPLE* for the Midpoint Rule for $n = 20$ sub-intervals as follows:

```
with(Student[Calculus1]):  
Q:=ApproximateInt(x^2,x=0..8, method=midpoint, partition=20);  
evalf(Q);  
ApproximateInt(x^2,x=0..8, method=midpoint, partition=20, output=plot);
```

Run Maple

Save

Load

MAPLE Output

[Print this page by clicking here.](#) (DO NOT use the File->Print menu item.)

```
> with(Student[Calculus1]):
```

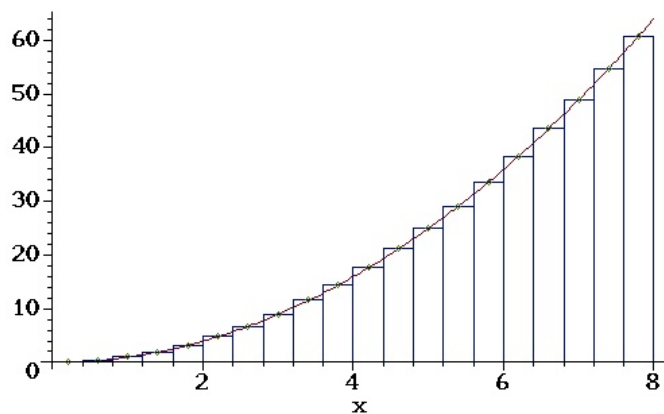
```
> Q:=ApproximateInt(x^2,x=0..8, method=midpoint, partition=20);
```

$$Q := \frac{4264}{25}$$

```
> evalf(Q);
```

170.5600000

```
> ApproximateInt(x^2,x=0..8, method=midpoint, partition=20, output=plot);
```



memory used=5.6MB, alloc=40.3MB, time=0.12

Example 2: Define the following function and plot it using MAPLE software.

a. $f(x) = x^4 - 3x^3 + x^2 + x + 1$

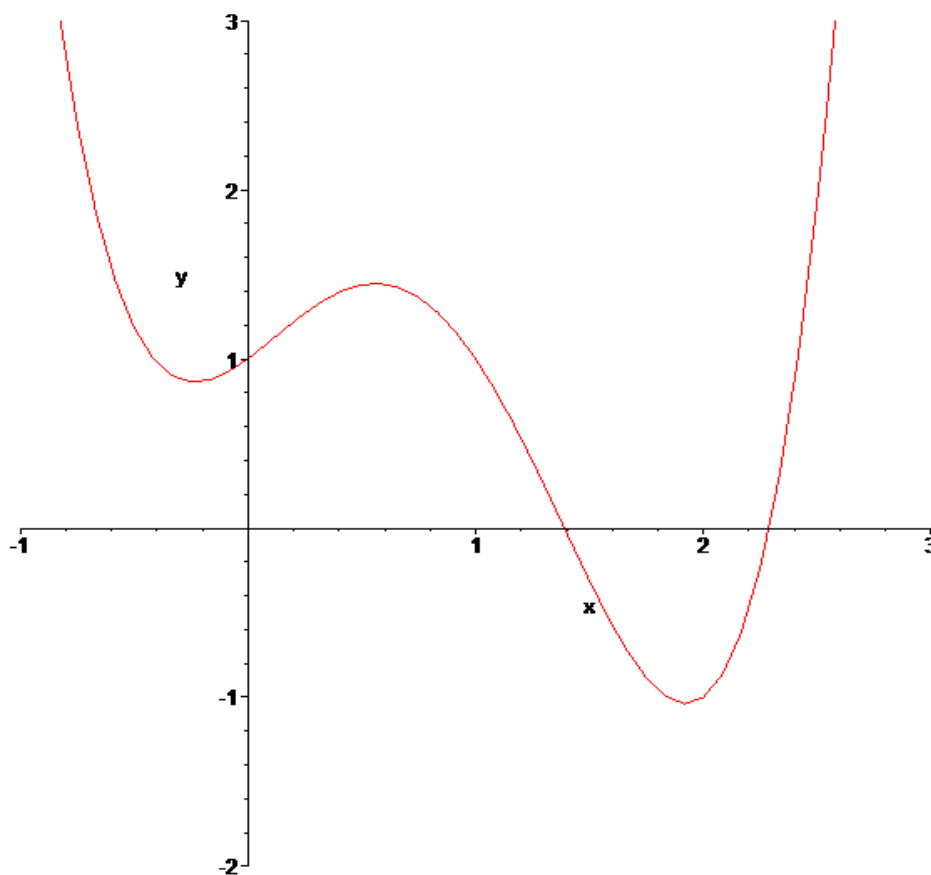
We define multiplication as “*”, and power, say to x^4 , as “ x^4 ”.

Therefore, our function can be defined and plotted as follows: (NOTE: PLEASE DO NOT FORGET THE SEMICOLON AT THE END OF EACH CODE)

➤ `f := x -> x^4 - 3*x^3 + x^2 + x + 1;`

$$f := x \rightarrow x^4 - 3x^3 + x^2 + x + 1$$

➤ `plot(f(x), x = -1..3, y = -2..3);`



**GOOD LUCK IN THE NUMERICAL
INTEGRATION**