Handout 3

MATH 172 Lab: Sections 7 and 8

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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**".

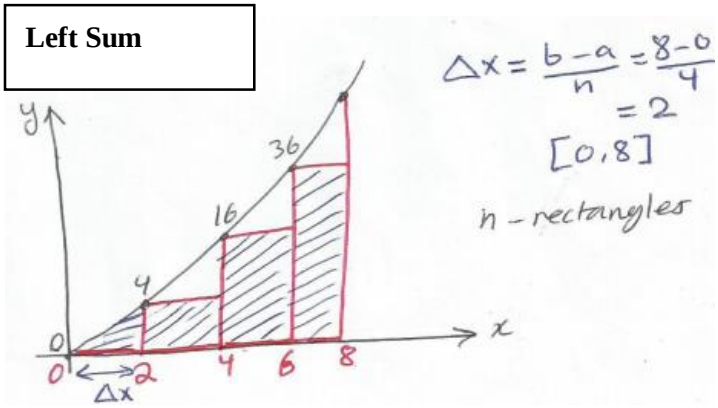
Sixth Step: You can now type Maple commands in the given text region, and then click on the "**Run Maple**" button.

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:

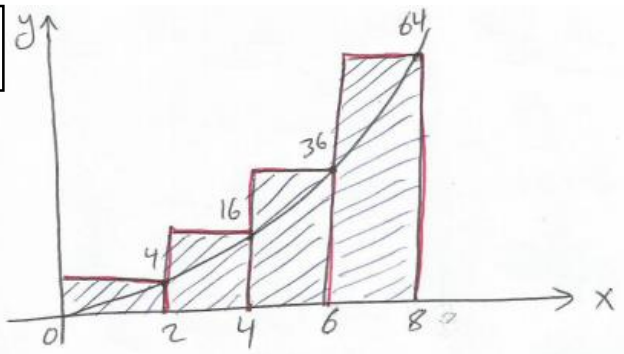
Left Sum



Riemann Sum for 4 sub-intervals

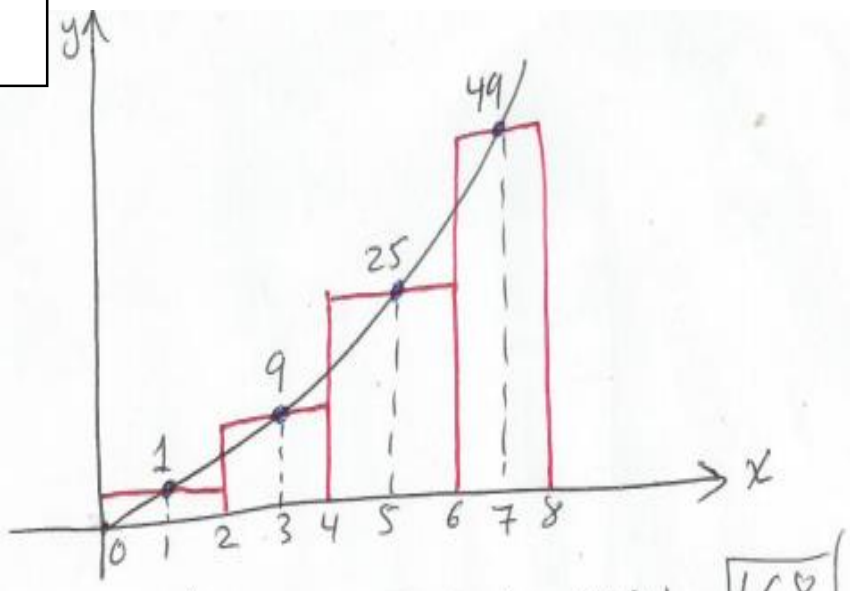
$$R_4 = \sum_{i=1}^{4} f(x_i)\Delta x = (2)(0)+(2)(4)+(2)(16)+2(36) = \boxed{110}$$

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.)

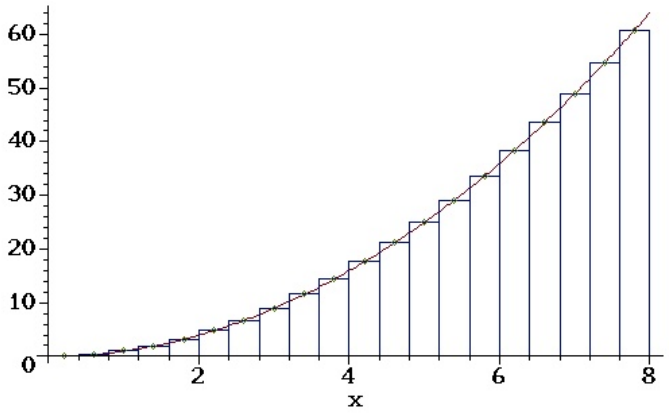
```
> with(Student[Calculus1]):
> Q:=ApproximateInt(x^2,x=0..8, method=midpoint, partition=20);
```

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

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

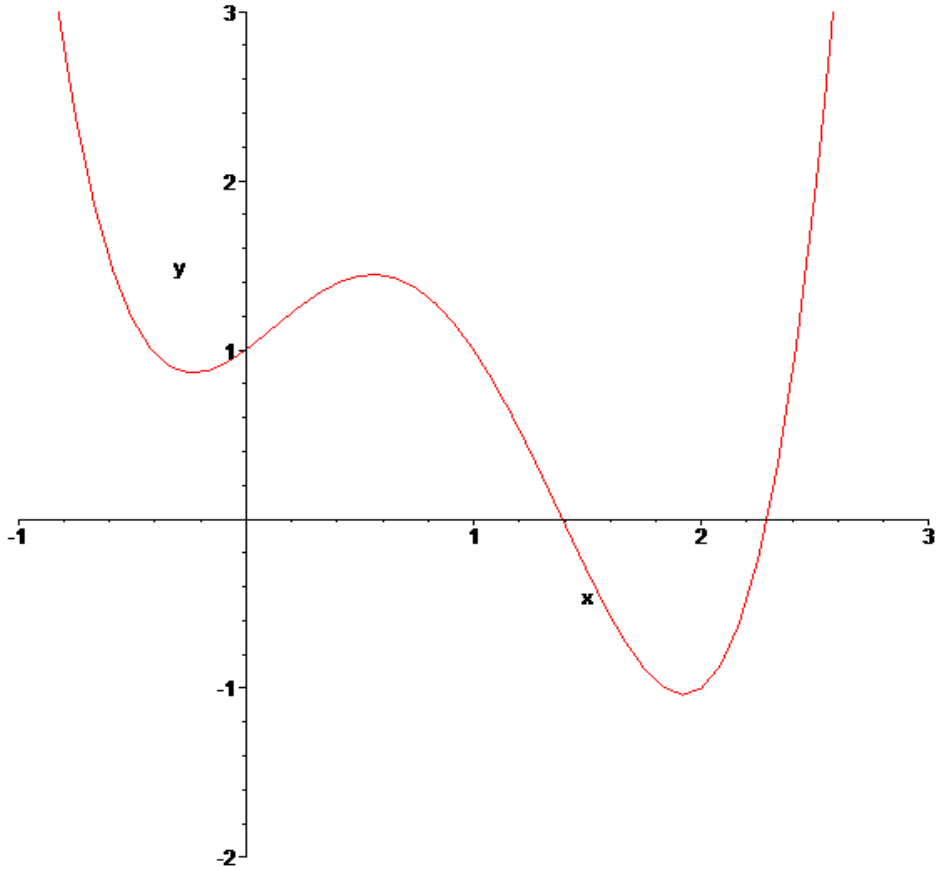
We define multiplication as " * ", and power, say to x^4, as " **x^4** ".

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;`

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

- `plot(f(x), x = -1..3, y = -2..3);`



GOOD LUCK IN THE NUMERICAL INTEGRATION LAB