

# Lab 4 Example and Hints - MATH 242 FALL 2020

By Li - An Chen Lab Section 40 & 41

---

## Example 1 - Left Rectangle Approximation

```
In[51]:= Clear[a, b, n]
a = 3;
b = 8.5;
n = 5;
width = (b - a) / n;

In[56]:= Clear[f]
f[x_] = x^3 + 2
width * Sum[f[a + i * width], {i, 0, n - 1}] // N

Out[57]= 2 + x^3

Out[58]= 991.98
```

---

## Example 2 - Right Rectangle Approximation

```
In[9]:= Clear[a, b, n]
a = 3;
b = 8.5;
n = 5;
width = (b - a) / n;

In[59]:= Clear[f]
f[x_] = x^3 + 2
width * Sum[f[a + (i + 1) * width], {i, 0, n - 1}] // N

Out[60]= 2 + x^3

Out[61]= 1637.82
```

---

## Example 3 - Midpoint Method

```
In[17]:= Clear[a, b, n]
a = 3;
b = 8.5;
n = 5;
width = (b - a) / n;

In[62]:= Clear[f]
f[x_] = x^3 + 2
width * Sum[f[a + (i + 1/2) * width], {i, 0, n - 1}] // N

Out[63]= 2 + x^3
Out[64]= 1286.2
```

### Exact solution to the example

```
In[25]:= Integrate[f[x], {x, a, b}]
Out[25]= 1295.77
```

---

## Example 4 - Trapezoid Approximation

```
In[29]:= Clear[a, b, n]
a = 3;
b = 8.5;
n = 5;
width = (b - a) / n;

In[65]:= Clear[f]
f[x_] = x^3 + 2
width * Sum[(f[a + (i) * width] + f[a + (i + 1) * width]) / 2, {i, 0, n - 1}] // N

Out[66]= 2 + x^3
Out[67]= 1314.9
```

---

## Assignment Questions

Note : Here's the output for your reference. You may check your answer with mine. But you need to submit the complete codes (input) and output for any credits.

## Q1a

Out[46]=  $x^4$

Out[47]= 40.8598

Note: Recall that we can add //N at the end of any computation code to get numerical values.

## Q1b

Out[121]=  $x^4$

Out[122]= 57.0598

## Q1c

Out[124]= 48.6

(essay question & computing the exact solution by Integrate[f[x],.....])

Hint: Sketch the function and rectangles, or check the reference plots on Canvas

## Q2a

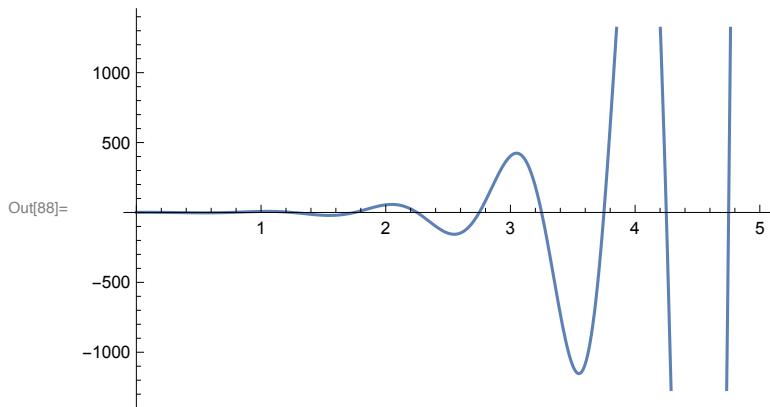
Out[85]=  $e^{2x} \cos [2\pi x]$

- 0.
- 9370.93
- 6617.13
- 473.523
- 279.007
- 720.236

## Q2b

(essay question; possibly add a plot)

Hint: Sketch the function or check my reference plots on Canvas



## Q2c

This is the exact solution:

Out[90]= 1013.17

My output using While loop (codes from my slides):

You can either do While Loop or simply by trying different value of n

{24, 921.215}

## Q3a

Out[102]=  $e^{2x} \cos(2\pi x)$

27163.3

14460.1

10451.

3158.67

2166.54

1521.24

## Q3b

My output using While loop (codes from my slides):

You can either do While Loop or simply by trying different value of n

{31, 1113.57}

---

## Q3c

(essay question, no computation)