

**Ahsanullah University of Science and Technology**

## ***LAB REPORT***

Course No: *EEE3110*

Course Name: *Numerical Technique Laboratory*

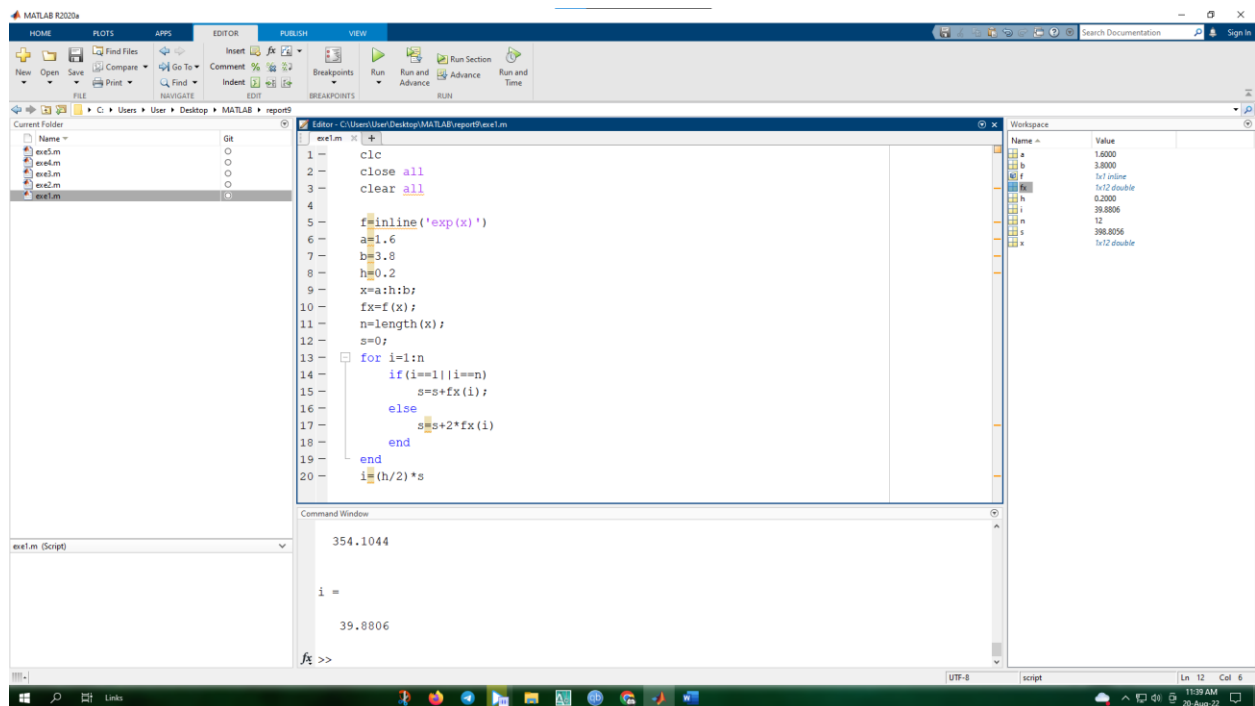
*Exp No:09*

*Exp Name: Numerical Intergration*

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- Year: 3 , Semester: 1
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# Exercise1

H=.2



H=.4

The MATLAB R2020a interface shows a script named 'exe1.m' being executed. The script defines a function  $f = \exp(x)$  and calculates the integral of  $f$  from  $a=1.6$  to  $b=3.8$  using a step size  $h=0.4$ . The result is displayed in the Command Window as 123.7319.

```
1 clc
2 close all
3 clear all
4
5 f=inline('exp(x)')
6 a=1.6
7 b=3.8
8 h=0.4
9 x=a:h:b;
10 fx=f(x);
11 n=length(x);
12 s=0;
13 for i=1:n
14     if (i==1 || i==n)
15         s=s+fx(i);
16     else
17         s=s+2*fx(i);
18     end
19 end
20 i=(h/2)*s
```

Command Window:

```
123.7319
i =
32.0660
fx >>
```

Workspace:

Name	Value
a	1.6000
b	3.8000
f	@f inline [...]
h	0.4000
i	32.0660
n	6
s	180.3301
x	[1.6000, 2.2, 2.8000, 2.8000, ...]

H=.6

The MATLAB R2020a interface shows a script named 'exe1.m' being executed. The script defines a function  $f = \exp(x)$  and calculates the integral of  $f$  from  $a=1.6$  to  $b=3.8$  using a step size  $h=0.6$ . The result is displayed in the Command Window as 55.8924.

```
1 clc
2 close all
3 clear all
4
5 f=inline('exp(x)')
6 a=1.6
7 b=3.8
8 h=0.6
9 x=a:h:b;
10 fx=f(x);
11 n=length(x);
12 s=0;
13 for i=1:n
14     if (i==1 || i==n)
15         s=s+fx(i);
16     else
17         s=s+2*fx(i);
18     end
19 end
20 i=(h/2)*s
```

Command Window:

```
55.8924
i =
25.7569
fx >>
```

Workspace:

Name	Value
a	1.6000
b	3.8000
f	@f inline [...]
h	0.6000
i	25.7569
n	4
s	85.8565
x	[1.6000, 2.2000, 2.8000, ...]

# Exercise2

a

```
1 close all
2 clear all
3
4 f=inline('exp(x)')
5 a=1.6
6 b=3.8
7
8 h=0.1
9 x=a:h:b;
10 fx=f(x);
11 n=length(x);
12 s=0;
13 for i=1:n
14     if (i==1 || i==n)
15         s=s+fx(i)
16     elseif (mod(i,2))==0
17         s=s+4*fx(i);
18     else
19         s=s+2*fx(i);
20     end
21 end
```

Command Window

```
1.1924e+03
i =
39.7482
fx >>
```

Workspace

Name	Value
a	1.6000
b	3.8000
f	1x1 inline function
fx	1x39 double
h	0.1000
i	39.7482
n	23
s	1.1924e+03
x	1x39 double

b

```
1 clear all
2
3 f=inline('exp(x)')
4 a=1.6
5 b=3.4
6
7 h=0.01
8 x=a:h:b;
9 fx=f(x);
10 n=length(x);
11 s=0;
12 for i=1:n
13     if (i==1 || i==n)
14         s=s+fx(i)
15     elseif (mod(i,3))==1
16         s=s+2*fx(i);
17     else
18         s=s+3*fx(i);
19     end
20 end
21 i=(3/8)*(s*h)
```

Command Window

```
6.6696e+04
i =
25.0111
fx >>
```

Workspace

Name	Value
a	1.6000
b	3.4000
f	1x1 inline function
fx	1x1807 double
h	1.0000e-03
i	25.0111
n	1801
s	6.6696e+04
x	1x1807 double

# Exercise3

a(i)

```
1 clc
2 close all
3 clear all
4
5 f=inline(' (1+x.^2).^ (-1) ')
6 a=1
7 b=-1
8 n=12
9 h=(a-b)/(n-1)
10 x=b:h:a;
11 fx=f(x);
12 %n=length(x);
13 s=0;
14 for i=1:n
15     if (i==1 || i==n)
16         s=s+fx(i);
17     else
18         s=s+2*fx(i)
19     end
20 end
21 i=(h/2)*s
```

Command Window

```
16.7485

i =

    1.5680

fx >>
```

Workspace

Name	Value
a	1
b	-1
f	1x1 inline
fx	1x12 double
h	0.1818
i	1.5680
n	12
s	17.2485

a(ii)

```
1 clc
2 close all
3 clear all
4
5 f=inline(' (x.^2).*(exp(-x)) ')
6 a=4
7 b=0
8 n=12
9 h=(a-b)/(n-1)
10 x=b:h:a;
11 fx=f(x);
12 %n=length(x);
13 s=0;
14 for i=1:n
15     if (i==1 || i==n)
16         s=s+fx(i);
17     else
18         s=s+2*fx(i)
19     end
20 end
21 i=(h/2)*s
```

Command Window

```
8.0781

i =

    1.5220

fx >>
```

Workspace

Name	Value
a	4
b	0
f	1x1 inline
fx	1x12 double
h	0.3636
i	1.5220
n	12
s	8.3712

$b(\text{simpson's } 1/3)$  for  $a(i)$  &  $a(ii)$

```

1 clc
2 close all
3 clear all
4
5 f=inline('(1+x.^2).^(-1)')
6 a=1
7 b=-1
8 n=12
9 h=(a-b)/(n-1)
10 x=b:h:a;
11 fx=f(x);
12 %n=length(x);
13 s=0;
14 for i=1:n
15     if (i==1 || i==n)
16         s=s+fx(i)
17     elseif (mod(i,2))==0
18         s=s+4*fx(i);
19     else
20         s=s+2*fx(i);
21     end
22 end
23 i=(h/3)*s

```

Command Window: 25.3727

Workspace:

Name	Value
a	1
b	-1
f	1x1 inline function
h	0.1818
i	1.5377
n	12
s	25.3727

```

3 clear all
4
5 f=inline('(x.^2).*(exp(-x))')
6 a=4
7 b=0
8 n=12
9 h=(a-b)/(n-1)
10 x=b:h:a;
11 fx=f(x);
12 %n=length(x);
13 s=0;
14 for i=1:n
15     if (i==1 || i==n)
16         s=s+fx(i)
17     elseif (mod(i,2))==0
18         s=s+4*fx(i);
19     else
20         s=s+2*fx(i);
21     end
22 end
23 i=(h/3)*s

```

Command Window: 12.2561

Workspace:

Name	Value
a	4
b	0
f	1x1 inline function
h	0.3889
i	1.4856
n	12
s	12.2561

$b(\text{simpson's } 3/8)$  for  $a(i)$  &  $a(ii)$

```

1 clc
2 close all
3 clear all
4
5 f=inline('1+x.^2).^(-1)')
6 a=1
7 b=-1
8 n=12
9 h=(a-b)/(n-1)
10 x=b:h:a;
11 fx=f(x);
12 %n=length(x);
13 s=0;
14 for i=1:n
15     if (i==1 || i==n)
16         s=s+fx(i)
17     elseif (mod(i,3))==1
18         s=s+2*fx(i);
19     else
20         s=s+3*fx(i);
21     end
22 end

```

Command Window: 22.8404

Workspace:

Name	Value
a	1
b	-1
f	1x1 inline function
fx	1x12 double
h	0.1818
i	1.5573
n	12
s	22.8404

```

1 clc
2 close all
3 clear all
4
5 f=inline('x.^2.*(exp(-x))')
6 a=4
7 b=0
8 n=12
9 h=(a-b)/(n-1)
10 x=b:h:a;
11 fx=f(x);
12 %n=length(x);
13 s=0;
14 for i=1:n
15     if (i==1 || i==n)
16         s=s+fx(i)
17     elseif (mod(i,3))==1
18         s=s+2*fx(i);
19     else
20         s=s+3*fx(i);
21     end
22 end

```

Command Window: 11.0674

Workspace:

Name	Value
a	4
b	0
f	1x1 inline function
fx	1x12 double
h	0.3836
i	1.5092
n	12
s	11.0674

Exercise 4&5 (Adaptive integration)