MA202

ASSIGNMENT 8

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SECTION:

2

Exercise 1

Consider that you are given a function $f(x) = \frac{\sin(\lambda x)}{x}$ whose integration is to be found from $x = -10$ to $x = 10$. Write a program that numerically evaluates such an integral using Trapezoidal Rule, Simpson's 1/3 Rule and Simpson's 3/8 Rule. Find the integral for the values of $\lambda = 0.01,0.1,1,10,100$, using each of these methods, and comment upon the results obtained.

Exercise 2

Repeat the same exercise as above for $g(x) = \exp(\sin(\lambda x))$, for which the integration limits are $x = 0$ to $x = 5\pi$.

Exercise 1

Code

The values of ain is changed repeatedly.

```
Lower=-10 ;
upper =10 ;
n= 100;

%Trapezoidal Rule, Simpson's One third Rule and Simpson's Three Eighth Rule
by multiple application
h = (upper-lower)/n;
xVec = lower :h:upper;
xVec(n+1) = upper +h;
xVec(n+2) = xVec(n+1)+h;
xVec(n+3) = xVec(n+2)+h ;

fVec = myFunInt(xVec);
%applying correction for sinx/x = 1 as x tends to 0
fVec(51) =1;

interval_trap = zeros(n,1);
interval_onethird = zeros(n,1);
interval_threeeigth = zeros(n,1);
for i = 1:n
    interval_trap(i)=(h/2)*(fVec(i)+fVec(i+1));
    interval_onethird(i)=(h/3)*(fVec(i)+4*fVec(i+1)+fVec(i+2));

interval_threeeigth(i)=(3*h/8)*(fVec(i)+3*fVec(i+1)+3*fVec(i+2)+fVec(i+3));
end
```

```
fprintf('The integration is ')
I_trap1 = sum(interval_trap)
I_onethird = sum(interval_onethird)
I_threeeight = sum(interval_threeeigth)
```

```
function fval = myFunInt(x)
 a = [0.01,0.1,1,10,100];

 ain= 0.01
 %ain= 0.1
 %ain= 01
 %ain= 10
 %ain= 100

 fval = sin(ain*x)./x;


end
```

Output

```
ain = 0.0100
The integration is
I_trap1 = 0.3979
I_onethird = 0.7958
I_threeeight = 1.1937
```

```
ain = 0.1000
The integration is
I_trap1 = 2.0721
I_onethird = 4.1440
I_threeeight = 6.2153
```

```
ain = 1
The integration is
I_trap1 = 3.3148
I_onethird = 6.6248
I_threeeight = 9.9232
```

```
ain = 10
The integration is
I_trap1 = 1.3455
I_onethird = 2.7126
I_threeeight = 4.0652
```

```
ain = 100
The integration is
I_trap1 = 2.1733
I_onethird = 4.3471
I_threeeight = 6.5225
```

Exercise 2

Code

The values of ain is changed repeatedly.

```
lower = 0;
upper =5*pi;
n= 100;

%Trapezoidal Rule, Simpson's One third Rule and Simpson's Three Eighth Rule
by multiple application
h = (upper-lower)/n;
xVec = lower :h:upper;
xVec(n+1) = upper +h;
xVec(n+2) = xVec(n+1)+h;
xVec(n+3) = xVec(n+2)+h;
```

```
fVec = myFunInt(xVec);
%applying correction for sinx/x = 1 as x tends to 0
interval_trap = zeros(n,1);
interval_onethird = zeros(n,1);
interval_threeeigth = zeros(n,1);
for i = 1:n
    interval_trap(i)=(h/2)*(fVec(i)+fVec(i+1));
    interval_onethird(i)=(h/3)*(fVec(i)+4*fVec(i+1)+fVec(i+2));

interval_threeeigth(i)=(3*h/8)*(fVec(i)+3*fVec(i+1)+3*fVec(i+2)+fVec(i+3));
end
fprintf('The integration is ')
I_trap1 = sum(interval_trap)
I_onethird = sum(interval_onethird)
I_threeeight = sum(interval_threeeigth)
```

```
function fval = myFunInt(x)
 a = [0.01,0.1,1,10,100];

 ain= 0.01
 %ain= 0.1
 %ain= 01
 %ain= 10
 %ain= 100
 fval = exp(sin(ain*x));

end
```

Output

```
ain = 0.0100
The integration is
I_trap1 = 17.0062
I_onethird = 34.0392
I_threeeight = 51.0992
```

```
ain = 0.1000
The integration is
I_trap1 = 31.0436
I_onethird = 62.3561
I_threeeight = 93.9342
```

```
ain = 1
The integration is
I_trap1 = 22.1031
I_onethird = 44.1683
I_threeeight = 66.1384
```

```
ain = 10
The integration is
I_trap1 = 20.1083
I_onethird = 40.3065
I_threeeight = 60.1863
```

```
ain = 100
The integration is
I_trap1 = 15.7080
I_onethird = 31.4159
I_threeeight = 47.1239
```
