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BLG202E CRN:21843 Homework 4

Q1)

```
>> syms x;
>> f(x)=exp(-x)*sin(x);
>> integral=0;
>> h=(3-0)/10;
>> for k=1:10
integral=integral+(f(0+h*(k-1))+f(0+(h*k)));
end
 >> integral=(h/2)*integral


integral =


(3*exp(-3)*sin(3))/20 + (3*exp(-3/2)*sin(3/2))/10 + (3*exp(-
3/5)*sin(3/5))/10 + (3*exp(-6/5)*sin(6/5))/10 + (3*exp(-3/10)*sin(3/10))/10
+ (3*exp(-9/5)*sin(9/5))/10 + (3*exp(-12/5)*sin(12/5))/10 + (3*exp(-
9/10)*sin(9/10))/10 + (3*exp(-21/10)*sin(21/10))/10 + (3*exp(-
27/10)*sin(27/10))/10


>> vpa(integral)


ans =


0.51323262781349185871774951387 21


>> int(f)


ans(x) =


-(exp(-x)*(cos(x) + sin(x)))/2


>> ans(3)-ans(0)
```

```
ans =

1/2 - (exp(-3)*(cos(3) + sin(3)))/2

>> vpa(ans)

ans =

0.52113143631128428503749688745287

>> abs(integral-ans)/ans %calculate error

ans =

0.0151570370686182
```

Q2)

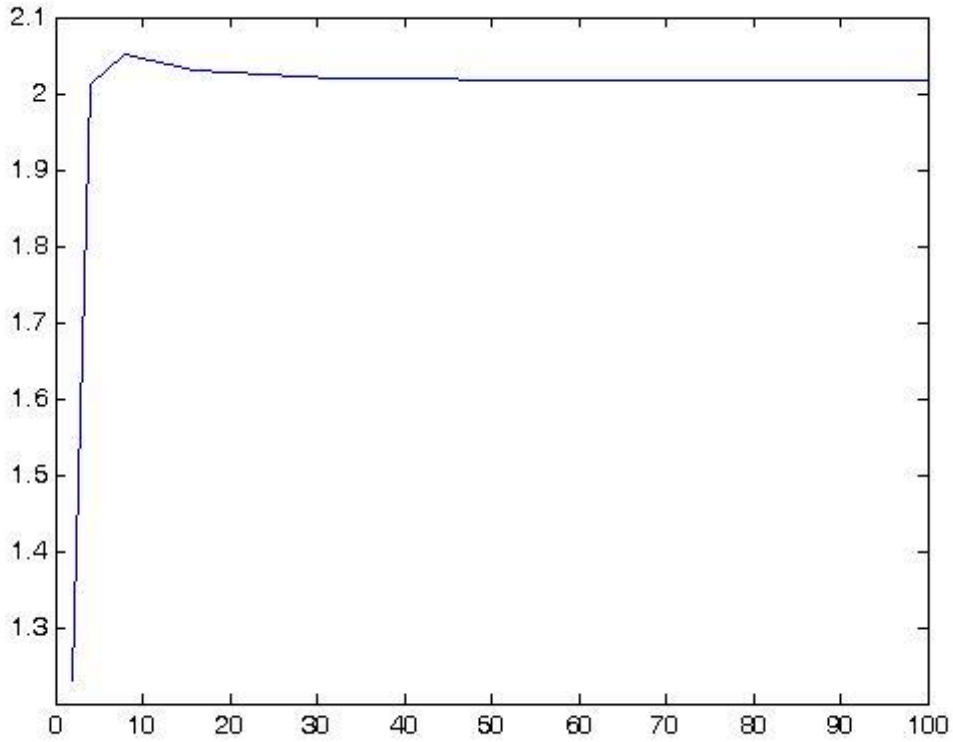
```
>> syms x;
>> f(x)=x*exp(2*x);
>> h=(4-0)/4;
>> integral=0;
>> for k=1:1  %r/2=2 r/2-1=1
integral=integral+2*f(0+(2*k-2)*h);
end
>> for k=1:2 %r/2=2
integral=integral+4*(f(0+(2*k-1)*h));
end
>> integral=integral+f(0)+f(4);
>> integral=integral*(h/3);


>> vpa(integral)
```

```
ans =

          5598.17789815848

>> int(f)

ans(x) =

(exp(2*x)*(2*x - 1))/4

>> ans(4)-ans(0)

ans =

(7*exp(8))/4 + 1/4

>> vpa(ans)

ans =

5216.926477323024480801286174042 6

>> (integral-ans)/ans %error

ans =

        0.0730796997988542
```

Q3)

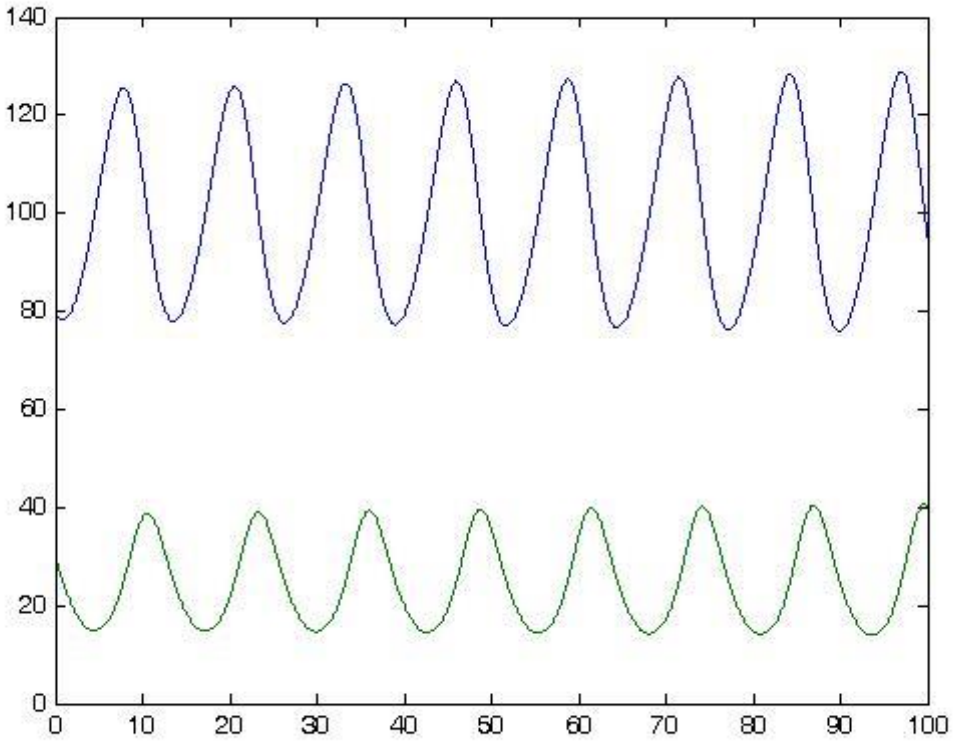
```
function [ result ] = compMid(m)

syms x;
f(x)=1+exp(-x)*sin(8*x^(2/3));
result=0;
h=(2-0)/m;
for i=1:m
    result=result+f(0+(i-0.5)*h);
end
result=result*h;
end
```

```
>> m=[2, 4, 8, 16, 32, 60, 70, 100];

>>
n=[compMid(2),compMid(4),compMid(8),compMid(16),compMid(32),compMid(60),com
pMid(70),compMid(100)];

>> vpa(n)


ans =


[ 1.2312160094741662892106778319419, 2.0111183723950209792049643091176,
2.0515167832617681898922458991 33, 2.0296063673806674447205729808381,
2.0206439591428174662552136906936, 2.0178298861476831083974206069886,
2.0174810171975077773770708666867, 2.0169450742923562242078367052761]


>> plot(m,n)

>>
```



Q4)

```
>> a=0;
>> b=100;
>> h=0.01;
>> size=abs(a-b)/h;
>> y1(1)=80;
>> y2(1)=30;
>> for i=2:10001
k11=0.25*y1(i-1)-0.01*y1(i-1)*y2(i-1);
k21=-1*y2(i-1)+0.01*y1(i-1)*y2(i-1);
y1(i)=y1(i-1)+k11*h;
y2(i)=y2(i-1)+k21*h;
end
>> t=a:h:b;
>> figure
>> plot(t,y1,t,y2)
>>
```



Q5)

```
>> a=0;
>> b=pi/2;
>> h=0.00005*pi;
>> y(1)=80;
>> size=abs(a-b)/h;
>> for i=2:10001
t=(i-2)*h;
k=1000*(y(i-1)-cos(0+(i-1)*h))-sin(t);
y(i)=y(i-1)-k*h;
end
>> 1-y(10001) %error

ans =

         0.998157081268119
>> h=0.0001*pi;
```

```
>> for i=2:10001
t=(i-2)*h;
k=1000*(y(i-1)-cos(0+(i-1)*h))-sin(t);
y(i)=y(i-1)-k*h;
end
>> 1-y(10001) %error

ans =

          1.99999842189198
>> h=0.0005*pi;
>> for i=2:10001
t=(i-2)*h;
k=1000*(y(i-1)-cos(0+(i-1)*h))-sin(t);
y(i)=y(i-1)-k*h;
end
>> 1-y(10001) %error

ans =

          1.99999912249383
>> h=0.001*pi;
>> for i=2:10001
t=(i-2)*h;
k=1000*(y(i-1)-cos(0+(i-1)*h))-sin(t);
y(i)=y(i-1)-k*h;
end
>> h=0.001*pi;
for i=2:10001
t=(i-2)*h;
k=1000*(y(i-1)-cos(0+(i-1)*h))-sin(t);
y(i)=y(i-1)-k*h;
```

```
end
>> 1-y(10001) %error


ans =


   NaN
```

Small h makes calculations more accurute, also for h=0.001 method becomes unstable and result goes to infity.