Solved by M@L!K HAFEEZ

MTH643 current papers

Question No.1

Find the numerical solution of the following equation using ode45 command and plot the curve on [0 2].

$$y'(x)=y-x^2+1 \quad , \quad y(0)=0.5$$

Solution

```
clc
clear all
close all
yprime=@(x,y)y-x^2+1;
xspan=[0,2];
y0=0.5;
[x,y]=ode45(yprime,xspan,y0);
plot(x,y)
```

Question No.2

Find the numerical solution of the following equation using ode45 command and plot the curve on [0 2].

$y'(x)=y-x^2+1$, $y(0)=0.5;0.3;3$

Solution

```
clc
clear all
close all
yprime=@(x,y)y-x^2+1;
xspan=[0,2];
y0=0.5:0.3:3;
[x,y]=ode45(yprime,xspan,y0);
plot(x,y)
```

Question No.3

Find the numerical solution of the following equation using ode45 command and plot the curve on x=0:0.2:2

$y'(x)=y-x^2+1$, $y(0)=0.5$

Solution

```
clc
clear all
close all
yprime=@(x,y)y-x^2+1;
xspan=[0:0.2:2];
y0=0.5;
[x,y]=ode45(yprime,xspan,y0);
plot(x,y)
```

Question No.4

Write a for loop to add first 20 numbers which are divisible by 5.

Solution

```
clc
clear all
close all
sum=0;
for k=5:5:100;
   sum=sum+k;
end
disp(sum)
```

Question No.5

Write a program which takes a value from user and then using for loop display all of its divisors.

Solution

```
clc
clear all
close all
x=input('enter a number:')
i=x;
for j=1:i;
   if mod(x,j)==0
      disp(j)
   end
end
```

Question No.6

Numerically approximate the solution of the following ode dy/dt=2t use time interval [0 5] and initial condition is y(0)=0 by using ode45 command.

Solution

```
clc
clear all
close all
f=@(t,y)2*t
tspan=[0 5];
y0=0;
[t y]=ode45(f,tspan,y0)
plot(t,y)
```

Question No.7

Write a function with name ‘myfunction’ which takes any two number as input and returns the greater number.

Solution

```
function [x,y]=myfunction(n1,n2)
if n1>n2
   fprintf('The max number is n1')
else
   fprintf('The max number is n2')
end
```

```
end
```

Question No.8

Write a function with name ‘newfunction’ which takes any two number as input and returns the highest common factor of the number.

Solution

```
function [HCF]=newfunction(n1,n2)
for i=1:1:(n1+n2);
   if mod(n1,i)==0 && mod(n2,i)==0
      HCF=i;
   end
end
```

Question No.9

Write a program which prints all the numbers divisible by 3 and 5 for a given number.

Solution

```
clc
clear all
close all
x=input('enter a number:')
n=x;
for i=1:n;
   if mod(i,3)==0 && mod(i,5)==0
      disp(i)
   end
end
```

Question No.10

Write a for loop which adds first 30 odd numbers.

Solution

```
clc
```

```
clear alll
close all
k=1:60;
sum=0;
for i=1:2:length(k);
   sum=sum+i;
end
disp(sum)
```

Question No.11

Write a function name cube takes a number as an input if the number is even return cube if odd then return square.

Solution

```
function [cubes square]=cube(n)
if mod(n,2)==1
   fprintf('square')
else
   fprintf('cube')
end
end
```

Question No.12

Find sum and write program

$$\sum_{k=1}^{n}\left(\frac{3}{x}\right)^{k}$$

and input x=4 and n=12.

Solution

```
clc
clear all
close all
n=1:12;
x=4;
sum=0;
for k=1:length(n);
   sum=sum+(3/x)^k;
```

```
end
disp(sum)
```

Question No.13

Solve the newton equation x^3+x by using for loop when x0=2 and n=3.

Solution

```
clc
clear all
close all
f=@(x)x^3+x
df=@(x)3*x^2+1
x0=2;
n=3;
x=x0;
for i=1:n;
   x=x-f(x)/df(x)
end
```

Question No.14

Solve the newton equation x^3+x by using while loop when x0=2 and n=3.

Solution

```
clc
clear all
close all
f=@(x)x^3+x
df=@(x)3*x^2+1
x0=2;
n=3;
x=x0;
tol=10^-4
while abs(f(x))>tol
   x=x-f(x)/df(x)
end
fprintf('Root: %o.15 f\n',x)
```

Question No.15

Write a function with the name ‘practisefunction’ which takes any three random variables as an input and returns the number in ascending order.

Solution

```
function [Ascending]=practisefunction(n1,n2,n3)
n1=input('enter the 1st number:')
n2=input('enter the 2nd number:')
n3=input('enter the 3rd number:')
A=[n1,n2,n3]
Ascendingorder=sort(A)
end
```

Question No.16

Find factorial of a number by using while loop.

Solution

```
clc
clear all
close all
n=input('enter a number:')
i=n;
fact=1;
if i==0
   fact=1;
elseif i<0
   fprintf('the number you are entered is nagative')
end
while i>0
   fact=fact*i;
   i=i-1;
end
disp(fact)
```

Question No.17

Find factorial of a number by using for loop.

Solution

```
clc
clear all
close all
n=input('enter a number:')
fact=1;
for i=1:n;
   fact=fact*i;
end
disp(fact)
```

Question No.18

write a function with name examquestions which take any two number as an input and return the sum and product of those number as output.

Solution

```
function [x y]=examquestions(x,y)
sum=x+y
product=x*y
end
```

Question No.19

Use while loop to calculate the factorial of 10.

Solution

```
clc
clear all
 close all
 n=10;
 i=n;
 fact=1;
 while i>0
    fact=fact*i;
    i=i-1;
 end
 disp(fact)
```

Question No.20

Numerically solve the following equation by using ode45 command

$\frac{dy}{dx} = \frac{y}{t^2} + \frac{2}{y}$ when y(0)=1

Solution

```
clc
clear all
close all
f=@(t,y)t/y^2+2/t
tspan=[2 -2];
y0=1;
[t y]=ode45(f,tspan,y0)
plot(t,y)
```

Question No.21

A=$\begin{bmatrix} 3/11 & 2/5 & 4/7 \\ 2/3 & 4/5 & 6/5 \end{bmatrix}$ and B=$\begin{bmatrix} 1/3 & 8/4 & 4 \\ 2/9 & 3/7 & 9/6 \\ 6 & 7/4 & 5/7 \end{bmatrix}$

Then find

i) invA
ii) A*B

Solution

```
clc
clear all
close all
A=sym([3/11 2/5 4/7;2/3 4/5 6/5])
B=sym([1/3 8/4 4;2/9 3/7 9/6;6 7/4 5/7])
C=inv(B)
D=sym(A*B)
```

Question No.22

2x+y+z=2

-x+y-z=3

x+2y+3z=-10

i) Write system in matlab as an augmented matrix
ii) Make reduced echelon form

Solution

```
clc
clear all
close all
syms x y z
A=[2,1,1;-1,1,-1;1,2,3]
B=[2;3;-10]
X=[x;y;z]
%AX=B%
C=rref(A,B)
```

Question No.23

y(x)=$\sqrt{1+x^3}$ solve the equation using simpson's 3/8 rule interval [1 5] and keep step size 12.

Solution

```
clc
clear all
close all
f=@(x)sqrt(1+x^3)
a=1;
b=5;
n=12;
h=(b-a)/n;
if rem(n,3)~=0
   fprintf('enter valid n')
   input('enter n as the multiple of 3')
end
sum1=0;
sum2=0;
```

```
for i=1:n-1;
   x(i)=a+i*h;
   if rem(i,3)==0
      sum1=sum1+f(x(i));
   else
      sum2=sum2+f(x(i));
   end
end
Area=3*h/8*(f(a)+f(b)+2*sum1+3*sum2)
```

Question No.24

$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5y = 7$ and y(0)=1 and y'(0)=0

Solve the differential equation.

Solution

```
clc
clear all
close all
syms y(t)
Dy=diff(y,t)
ode=diff(y,t,2)+2*diff(y,t)+5*y==7
cond1=y(0)==1
cond2=Dy(0)==0
cond=[cond1,cond2]
sol=dsolve(ode,cond)
```

Question No.25

Solve $x-2\sin(x^2)=0$ by using bisection method perform 10 iterations to find the root between 0.4 and 0.6.

Solution

```
clc
clear all
 close all
```

```
f=@(x)x-2*sin(x^2)
a=0.4;
b=0.6;
n=10;
if f(a)*f(b)>0
   fprintf('there is no change of sign:')
   return
end
tol=10^-4
disp('iteration number a b c')
i=1;
while (abs(a-b)>=tol)
   c=(a+b)/2;
   if f(c)==0
      fprintf('root of the function is %f:',c)
      return
   end
   fprintf('%2i \t %f \t %f \t %f \n',i,a,b,c)
   if f(a)*f(c)>0
      a=c;
   else
      b=c;
      i=i+1;
   end
end
m=(a+b)/2
fprintf('root lies at c=%f \n',m)
```

Question No.26

Write a function with name ‘circlecalculation’which take the circle of radius as input and circf as output.

Solution

```
function [circf]=circlecalculation(radius)
radius=input('enter the radius of circle:')
circf=2*pi*radius
end
```

Question No.27

y(x)=$\sqrt{1+x^3}$ solve the equation using simpson's 1/3rule interval [1 5] and keep step size 10.

Solution

```
clc
clear all
close all
f=@(x)sqrt(1+x^3)
a=1;
b=5;
n=12;
h=(b-a)/n;
if rem(n,2)~=0
   fprintf('enter valid n')
   input('enter n as the even multiple')
end
sum1=0;
sum2=0;
for i=1:n-1;
   x(i)=a+i*h;
   if rem(i,2)==0
      sum1=sum1+f(x(i));
   else
      sum2=sum2+f(x(i));
   end
end
Area=h/3*(f(a)+f(b)+2*sum1+4*sum2)
```

Question No.28

A=$\begin{bmatrix} 3/11 & 2/5 & 4/7 \\ 2/3 & 4/5 & 6/5 \end{bmatrix}$ and B=$\begin{bmatrix} 1/3 & 8/4 & 4 \\ 2/9 & 3/7 & 9/6 \\ 6 & 7/4 & 5/7 \end{bmatrix}$

Then find

i) Sum of 3rd row of B

ii) Sum of 2nd column of A

Solution

```
clc
clear all
close all
A=sym([3/11 2/5 4/7;2/3 4/5 6/5])
B=sym([1/3 8/4 4;2/9 3/7 9/6;6 7/4 5/7])
SumA=sum(A(:,2))
SumB=sum(B(3,:))
```

Question No.29

Solve the following equation $x^2/2$ by using trapezoidal rule in the interval [4 6] by using step size 10.

Solution

```
clc
clear all
close all
f=@(x)x^2/2
a=4;
b=6;
n=10;
h=(b-a)/n;
sum=0;
for i=1:n-1;
    x(i)=a+i*h;
    y(i)=f(x(i));
    sum=sum+y(i);
end
Area=h/2*(f(a)+f(b)+2*sum)
```

Question No.30

Solve the following equation $x^2/2$ by using reimann sum in the interval [4 6] by using step size 10.

Solution

```
clc
clear all
close all
```

```
f=@(x)x^2/2
a=4;
b=6;
n=10;
dx=(b-a)/n;
value=0;
for i=1:n;
   c=a+i*dx;
   value=value+f(c);
end
Area=value*dx
```

Question No.31

Find the value of X if

$A=\begin{bmatrix}1 & 3\\ 2 & 4\end{bmatrix}$ and $B=\begin{bmatrix}-2\\ 3\end{bmatrix}$

Solution

```
clc
clear all
close all
A=[1,3;2,4]
B=[-2;3]
% As we know that
% AX=B
% X=inv(A)*B
C=inv(A)
X=C*B
```

Question No.32

Solve the system of linear equation by using solve command.

3x+2y+x=1

y=2

x+2y=3

Solution

```
clc
clear all
close all
A='3*x+2*y+z=1'
B='y=2'
C='x+2*y=3'
sol=solve(A,B,C)
Answer=double([sol.x,sol.y,sol.z])
```

Question No.33

Find the eigen values and eigen vector of the following matrix.

$$A=\begin{bmatrix}3 & 1 & 4\\ 7 & 8 & 9\\ 3 & 1 & 3\end{bmatrix}$$

Solution

```
clc
clear all
close all
A=[3,1,4;7,8,9;3,1,3]
V=eig(A)
[u v]=eig(A)
```

Remember Me in your Prayers