

MAT 2002 – ADDE

Assignment 3

Name-Tanmay Mahajan

Reg. no.-19bce1735

Prof.- Dr. Somnath Bera

Que)

- 1) Solve the differential equation $\frac{d^2y}{dx^2} + xy = 0$ for the series solution up to x^6 .

Command Window-

```
The general solution of the given ode around x=0 is given by:  
- (c_1*x^5)/15 - (c_1*x^3)/3 - c_0*x^2 + c_1*x + c_0
```

```
Enter y(0) :
```

```
4
```

```
i1 =
```

```
4
```

```
Enter Dy(0):
```

```
5
```

```
i2 =
```

```
5
```

```
zz =
```

```
- x^5/3 - (5*x^3)/3 - 4*x^2 + 5*x + 4
```

```
The Particular solution of the given ode around x=0 is given by:
```

```
- x^5/3 - (5*x^3)/3 - 4*x^2 + 5*x + 4
```

Que2)

2) Solve the following differential equations with boundary conditions

i. $\frac{d^2y}{dx^2} + x^2y = 0, y(0) = 1, y'(0) = 1$, six terms

ii. $\frac{d^2y}{dx^2} + xy' + y = 0, y(0) = 1, y'(0) = 1$, 7 terms

iii. $\frac{d^2y}{dx^2} + y = 0, y(0) = 0, y'(0) = 1$, 8 terms

Code-

```
1 clear all
2 syms x c_0 c_1 c_2 c_3 c_4 c_5 c_6
3 p1x=input('Coefficient of D2y :')
4 p2x=input('Coefficient of Dy :')
5 p3x=input('Coefficient of y :')
6 c=[c_0, c_1, c_2, c_3, c_4, c_5, c_6]
7 y=sum(c.*(x).^(0:6))
8 dy=diff(y)
9 d2y=diff(dy)
10 ode=p1x*d2y+p2x*dy+p3x*y
11 ps=collect(ode,x)
12 d=coeffs(ps,x)
13 [c_2,c_3,c_4,c_5,c_6]=solve(d(1),d(2),d(3),d(4),d(5),{c_2,c_3,c_4,c_5,c_6})
14 z=subs(y)
15 disp('The general solution of the given ode around x=0 is given by:')
16 disp(z)
17 i1=input('Enter y(0) :')
18 i2=input('Enter Dy(0):')
19 zz=subs(z,[c_0,c_1],[i1,i2])
20 disp(' The Particular solution of the given ode around x=0 is given by:')
21 disp(zz)
22 ezplot(zz,[-4 4])
```

Command Window-

1)

Command Window

The general solution of the given ode around $x=0$ is given by:

$$c_0 + c_1x - (c_0x^4)/12 - (c_1x^5)/20$$

Enter $y(0)$:

1

i1 =

1

Enter $Dy(0)$:

1

i2 =

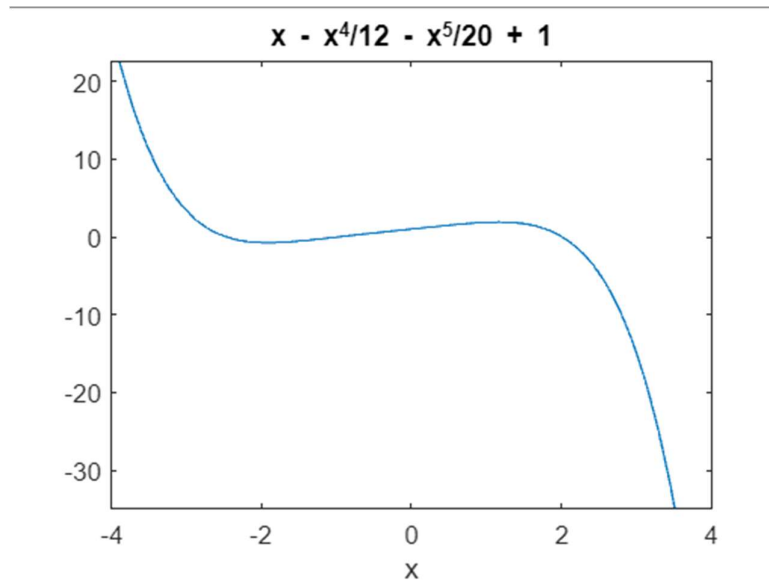
1

zz =

$$- x^5/20 - x^4/12 + x + 1$$

The Particular solution of the given ode around $x=0$ is given by:

$$- x^5/20 - x^4/12 + x + 1$$



2)

Command Window

The general solution of the given ode around $x=0$ is given by:

$$- \frac{(c_0 x^6)}{48} + \frac{(c_1 x^5)}{15} + \frac{(c_0 x^4)}{8} - \frac{(c_1 x^3)}{3} - \frac{(c_0 x^2)}{2} + c_1 x + c_0$$

Enter $y(0)$:

1

i1 =

1

Enter $Dy(0)$:

1

i2 =

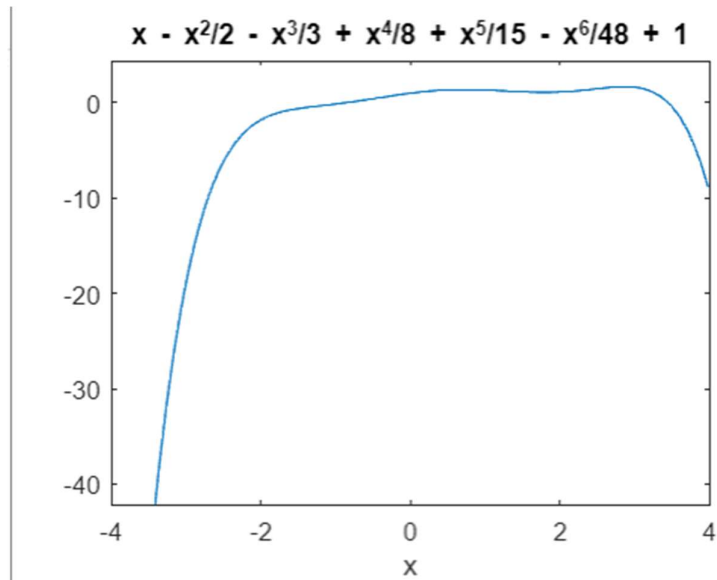
1

zz =

$$- \frac{x^6}{48} + \frac{x^5}{15} + \frac{x^4}{8} - \frac{x^3}{3} - \frac{x^2}{2} + x + 1$$

The Particular solution of the given ode around $x=0$ is given by:

$$- \frac{x^6}{48} + \frac{x^5}{15} + \frac{x^4}{8} - \frac{x^3}{3} - \frac{x^2}{2} + x + 1$$



3)

The general solution of the given ode around $x=0$ is given by:

$$- (c_0 x^6)/720 + (c_1 x^5)/120 + (c_0 x^4)/24 - (c_1 x^3)/6 - (c_0 x^2)/2 + c_1 x + c_0$$

Enter $y(0)$:

0

i1 =

0

Enter $Dy(0)$:

1

i2 =

1

zz =

$$x^5/120 - x^3/6 + x$$

The Particular solution of the given ode around $x=0$ is given by:

$$x^5/120 - x^3/6 + x$$

