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Lab Slot:L46+L47+L48 - MATLAB-ADDE

EXERCISE NUMBER 9 :
DATE OF THE EXERCISE: 06-10-2020

**Title:Power Series solution about x=0 for ordinary differential equations**

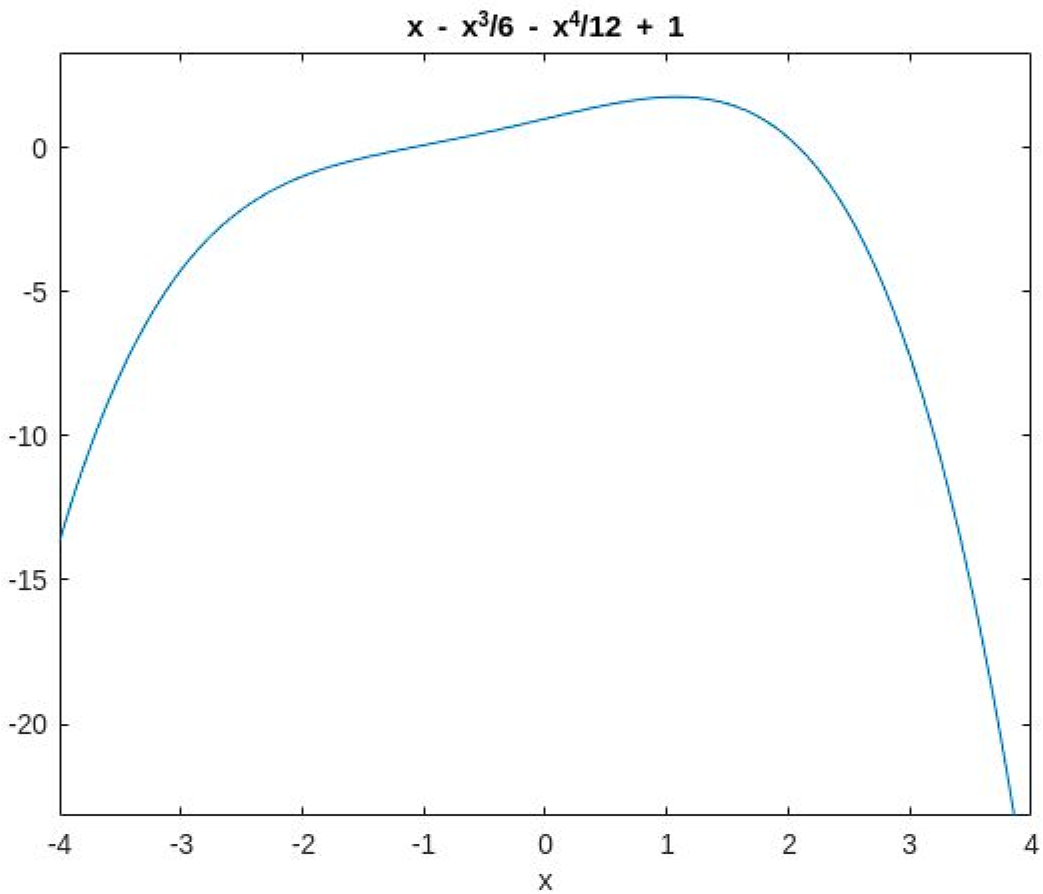
## Matlab Code:

```
clc
clear all
format compact
syms x c0 c1 c2 c3 c4 c5
p1x = input('Coefficient of D2y: ')
p2x = input('Coefficient of Dy: ')
p3x = input('Coefficient of y: ')
c = [c0,c1,c2,c3,c4,c5]
y = sum(c.*(x).^(0:5))
dy = diff(y)
d2y = diff(dy)
ode = p1x*d2y+p2x*dy+p3x*y
ps = collect(ode,x)
d = coeffs(ps,x)
[c2,c3,c4,c5] = solve(d(1),d(2),d(3),d(4),{c2,c3,c4,c5})
disp('The general solution of the given ode around x = 0 is given by: ')
z = subs(y)
i1 = input('Enter y(0): ')
i2 = input('Enter Dy(0): ')
zz = subs(z,[c0,c1],[i1,i2])
disp('The Particular solution of the given ode around x=0 is given by: ')
disp(zz)
ezplot(zz,[-4 4])
```

## Output:

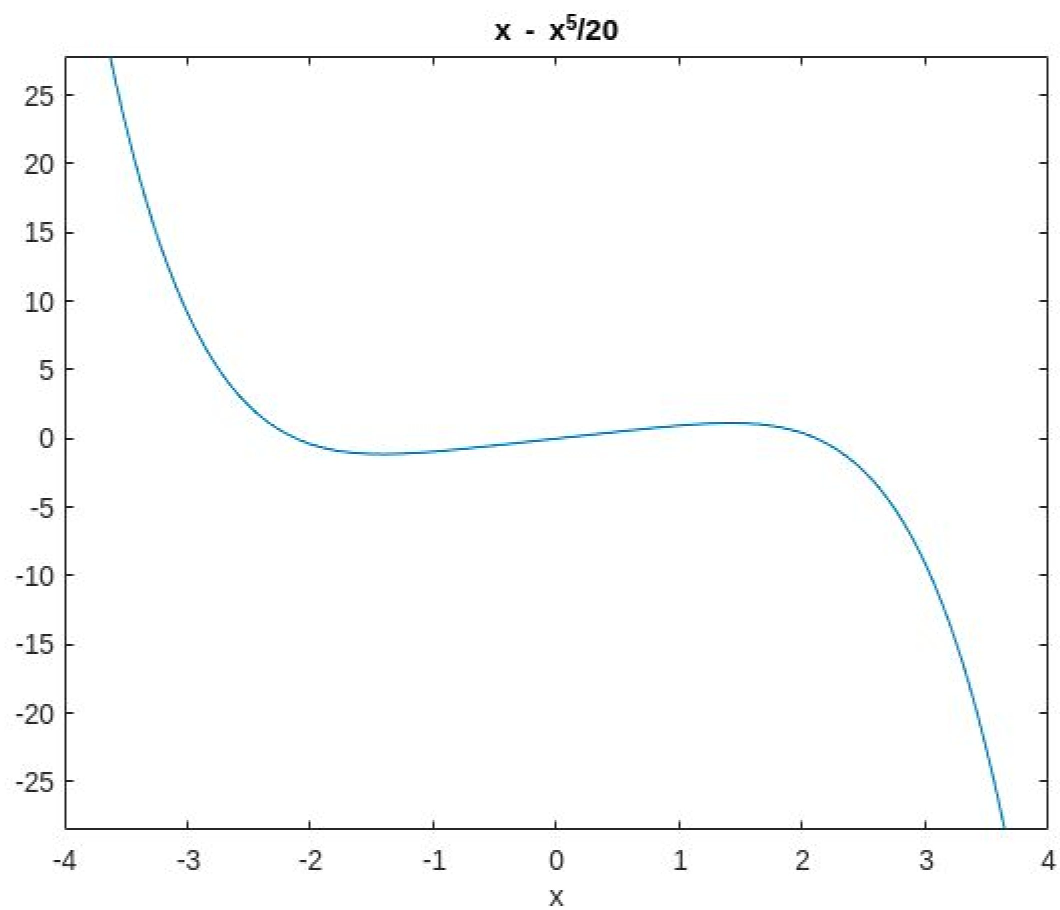
```
Coefficient of D2y:
1
p1x =
   1
Coefficient of Dy:
0
p2x =
   0
Coefficient of y:
x
p3x =
x
c =
[c0, c1, c2, c3, c4, c5]
y =
c5*x^5 + c4*x^4 + c3*x^3 + c2*x^2 + c1*x + c0
dy =
5*c5*x^4 + 4*c4*x^3 + 3*c3*x^2 + 2*c2*x + c1
d2y =
20*c5*x^3 + 12*c4*x^2 + 6*c3*x + 2*c2
ode =
2*c2 + 6*c3*x + x*(c5*x^5 + c4*x^4 + c3*x^3 + c2*x^2 + c1*x + c0) + 12*c4*x^2 +
20*c5*x^3
ps =
c5*x^6 + c4*x^5 + c3*x^4 + (c2 + 20*c5)*x^3 + (c1 + 12*c4)*x^2 + (c0 + 6*c3)*x + 2*c2
d =
[2*c2, c0 + 6*c3, c1 + 12*c4, c2 + 20*c5, c3, c4, c5]
c2 =
0
c3 =
-c0/6
c4 =
-c1/12
c5 =
0
The general solution of the given ode around x = 0 is given by:
```

```
z =
c0 + c1*x - (c0*x^3)/6 - (c1*x^4)/12
Enter y(0):
1
i1 =
   1
Enter Dy(0):
1
1
i2 =
   1
zz =
- x^4/12 - x^3/6 + x + 1
The Particular solution of the given ode around x=0 is given by:
- x^4/12 - x^3/6 + x +  1
```



```
Coefficient of D2y:
1
p1x =
   1
Coefficient of Dy:
0
p2x =
   0
Coefficient of y:
x^2
p3x =
x^2
c =
[c0, c1, c2, c3, c4, c5]
y =
c5*x^5 + c4*x^4 + c3*x^3 + c2*x^2 + c1*x + c0
dy =
5*c5*x^4 + 4*c4*x^3 + 3*c3*x^2 + 2*c2*x + c1
d2y =
20*c5*x^3 + 12*c4*x^2 + 6*c3*x + 2*c2
ode =
2*c2 + 6*c3*x + 12*c4*x^2 + 20*c5*x^3 + x^2*(c5*x^5 + c4*x^4 + c3*x^3 + c2*x^2 +
c1*x + c0)
ps =
c5*x^7 + c4*x^6 + c3*x^5 + c2*x^4 + (c1 + 20*c5)*x^3 + (c0 + 12*c4)*x^2 + 6*c3*x +
2*c2
d =
[2*c2, 6*c3, c0 + 12*c4, c1 + 20*c5, c2, c3, c4, c5]
c2 =
0
c3 =
0
c4 =
-c0/12
c5 =
-c1/20
The general solution of the given ode around x = 0 is given by:
```

```
z =
c0 + c1*x - (c0*x^4)/12 - (c1*x^5)/20
Enter y(0):
0
i1 =
    0
Enter Dy(0):
1
i2 =
    1
zz =
- x^5/20 + x
The Particular solution of the given ode around x=0 is given by:
- x^5/20 + x
```



```
Coefficient of D2y:
1
p1x =
   1
Coefficient of Dy:
x
p2x =
x
Coefficient of y:
1
p3x =
   1
c =
[c0, c1, c2, c3, c4, c5]
y =
c5*x^5 + c4*x^4 + c3*x^3 + c2*x^2 + c1*x + c0
dy =
5*c5*x^4 + 4*c4*x^3 + 3*c3*x^2 + 2*c2*x + c1
d2y =
20*c5*x^3 + 12*c4*x^2 + 6*c3*x + 2*c2
ode =
c0 + 2*c2 + c1*x + 6*c3*x + c2*x^2 + c3*x^3 + 12*c4*x^2 + c4*x^4 + 20*c5*x^3 + c5*x^5
+ x*(5*c5*x^4 + 4*c4*x^3 + 3*c3*x^2 + 2*c2*x + c1)
ps =
6*c5*x^5 + 5*c4*x^4 + (4*c3 + 20*c5)*x^3 + (3*c2 + 12*c4)*x^2 + (2*c1 + 6*c3)*x + c0 +
2*c2
d =
[c0 + 2*c2, 2*c1 + 6*c3, 3*c2 + 12*c4, 4*c3 + 20*c5, 5*c4, 6*c5]
c2 =
-c0/2
c3 =
-c1/3
c4 =
c0/8
c5 =
c1/15
The general solution of the given ode around x = 0 is given by:
z =
(c1*x^5)/15 + (c0*x^4)/8 - (c1*x^3)/3 - (c0*x^2)/2 + c1*x + c0
Enter y(0):
```

1
1
i1 =
    1
Enter Dy(0):
1
1
i2 =
    1
zz =
x^5/15 + x^4/8 - x^3/3 - x^2/2 + x + 1
The Particular solution of the given ode around x=0 is given by:
x^5/15 + x^4/8 - x^3/3 - x^2/2 + x + 1