Matlab

Lab7

Question:-

Using matlab solve the equation with power series methods

$$x^2 y'' + xy' + (3x^2 {}_\Gamma - 2)y = 0,$$

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

$$x^2 y'' + xy' - (4x^2 + \frac{1}{2})y = 0,$$

$$t^2 y'' - 3 t y' + 4y = 0$$

Code in matlab:

```
1
2 -    fprintf('25.a')
3 -    syms y(x) x;
4 -    A = x^2*diff(y,x,2)+x*diff(y,x)+(3*x^2-2)*y ==0
5 -    dsolve (A)
6 -    fprintf ('25.b')
7 -    B = x^2*diff(y,x,2)+2*x*diff(y,x)+(x^2-1)*y ==0
8 -    fprintf('In terms of Y')
9 -    dsolve (B)
10 -   fprintf('In terms of Z')
11
12 -   syms z(x);
13 -   n = sqrt(5/4);
14 -   B = x^2*diff(z,x,2)+x*diff(z,x)+(x^2-n^2)*z ==0
15 -   B1 = dsolve(B)
16 -   fprintf ('25.c')
17 -   C = x^2*diff(y,x,2)+x*diff(y)-(4*x^2+(1/2))*y ==0
18
19 -   dsolve(C)
20 -   fprintf('25.d')
21 -   syms y(t) t;
22 -   D = t^2*diff(y,t,2)-(3*t*diff(y,t))+4*y ==0
23 -   dsolve (D)
24
```

Output:

```
>> bessel
25.a
A(x) =

x^2*diff(y(x), x, x) + x*diff(y(x), x) + y(x)*(3*x^2 - 2) == 0


ans =

C1*besselj(2^(1/2), 3^(1/2)*x) + C2*bessely(2^(1/2), 3^(1/2)*x)

25.b
B(x) =

x^2*diff(y(x), x, x) + y(x)*(x^2 - 1) + 2*x*diff(y(x), x) == 0

In terms of Y
ans =

(C1*besselj(5^(1/2)/2, x))/x^(1/2) + (C2*bessely(5^(1/2)/2, x))/x^(1/2)

In terms of Z
B(x) =

x^2*diff(z(x), x, x) + z(x)*(x^2 - 5/4) + x*diff(z(x), x) == 0


B1 =

C1*besselj(-5^(1/2)/2, x) + C2*bessely(-5^(1/2)/2, x)


25.c
C(x) =

x^2*diff(y(x), x, x) + x*diff(y(x), x) - y(x)*(4*x^2 + 1/2) == 0


ans =

C1*besselj(2^(1/2)/2, x*2i) + C2*bessely(2^(1/2)/2, x*2i)

25.d
D(t) =

4*y(t) + t^2*diff(y(t), t, t) - 3*t*diff(y(t), t) == 0


ans =

C2*t^2 + C1*t^2*log(t)
```