PDEs, Solving/Graphing PDEs

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PARTIAL DIFFERENTIAL EQUATIONS

$\frac{\partial F}{\partial x}$ = diff(f, x)

$\frac{\partial^2 F}{\partial x^2}$ = diff(f, x, 2)

TAYLOR SERIES / McLAURIN'S SERIES

taylor(f, 'ExpansionPoint', 2, 'Order', 3)

- 2 → Point about which f is expanded
- 3 → no. of expansions

For Mclaurins, x = 0 is the point. So dont specify ExpansionPoint

taylor(f, 'Order', 3)

LDE

$\frac{dy}{dt} = ty$

```
> syms y(t)
```

- Define eqn using ==

```
> ode = diff(y,t) == t*y
```

- solve using dsolve

```
ySol(t) = dsolve(ode)
```

$\frac{dx}{dt} = x + t$, given $x(0) = 0$

```
> syms x(t)
```

```
> syms x(t)
> ode = diff(x,t) == x+t
> xSol(t) = dsolve(ode)
```

OUTPUT: `xSol(t) = C1*exp(t) - t - 1`

To find value of C1:

```
> cond = x(0)==0
>xSol(t) = dsolve(ode, cond)
```

$y'' + 9y = 0$

```
syms y(x)
ode = diff(y,x,2) + 9*y == 0;
ySol(x) = dsolve(ode)
```

$y'' - 3y' + 2y = 0 ; \; y(0) = -1; \; y'(0) = 0$

```
syms y(x)
 Dy = diff(y);
D2y = diff(y,2);
ode = D2y - 3*Dy + 2*y == 0;
ySol = dsolve(ode, y(0)==-1, Dy(0)==0)
% define the initial => condition for 'Dy(0)' to be 'some value'
figure
ezplot(ySol)
```

$4y''' + 4y'' + y' = 0$

```
syms y(x)
```

```
syms y(x)
D3y = diff(y,3);
D2y = diff(y,2);
Dy = diff y;
ode = 4*D3y + 4*D2y + Dy == 0;
ysol(x) = dsolve(ode)
```

$y''' - 6y'' + 11y' - 6y = 0,\ y(0)=0,\ y'(0)=0,\ y''(0)=2$

```
syms y(x)
Dy = diff(y);
D2y = diff(y,2);
D3y = diff(y,3);
ode = D3y - 6*D2y + 11*Dy - 6*y == 0;
ysol = dsolve( ode, y(0)==0, Dy(0)==0, D2y(0)==2)
```

$\frac{d^4y}{dx^4} + 4y = 0$

```
syms y(x)
ode = diff(y,x,4) + 4*y == 0;
ysol(x) = dsolve(ode)
```

$y'' + 4y' + 13y = 18e^{-2x},\ y(0)=0,\ y'(0)=4$

```
syms y(x)
D4 = diff(4)
```

```
syms y(x)
Dy = diff(y)
D2y = diff(y,2)
ode = D2y + 4*Dy + 13*y == 18*exp(-2*x)
ySol(x) = dsolve(ode, y(0)==0, Dy(0)==4)
figure
ezplot(ySol)
```