

SymPy is a Python library for symbolic mathematics. For more details please see: <https://www.sympy.org>

```
1 from sympy import *
2 import sympy as sp
```

First, we should define the symbolic independent variable, and then define the function which depend:

```
1 x = sp.Symbol("x")
2 f = sp.Function("f")(x)
3 f
```

To take the first derivative of $f(x)$ w.r.t. x ;

```
1 f.diff(x)
```

Double-click (or enter) to edit

And to take the second derivative of $f(x)$ w.r.t. x ;

```
1 f.diff(x, x)
```

Now, assume we want to solve this differential equation:

$$-5f(x) + \frac{d}{dx}f(x) + \frac{d^2}{dx^2}f(x) = 0$$

And we know that the answer is:

$$f(x) = C_1 e^{\frac{x}{2}(-1+\sqrt{21})} + C_2 e^{\frac{x}{2}(-\sqrt{21}-1)}$$

Let's try to find the answer using SymPy:

Using `Eq()` function, we can define the ODE:

```
1 diff_eq = Eq(f.diff(x,x) + f.diff(x) -5*f, 0)
2 diff_eq
```

To solve this equation, we can use `dsolve()` function:

```
1 ans = dsolve(diff_eq, t)
2 ans
```

Source: <https://www.youtube.com/watch?v=Dkifb6nytao&list=PLSuQRd4LfSUT3oYobJOcxRGdZ8CGI>