

```
> # 3.3 Application:  $y^{(4)} + 2y^{(3)} + 3y = 0$ 
> de:=diff(y(x),x,x,x,x)+2*diff(y(x),x,x,x)+3*y(x)=0;
```

$$de := \frac{d^4}{dx^4} y(x) + 2 \left(\frac{d^3}{dx^3} y(x) \right) + 3 y(x) = 0 \quad (1)$$

```
> dsolve(de,y(x));
```

$$y(x) = \sum_{a=1}^4 e^{\text{RootOf}(-Z^4 + 2_Z^3 + 3, \text{index}=_a) x} _C_{_a} \quad (2)$$

```
> evalf(%);
```

$$y(x) = e^{(0.6050434043 + 0.8350786687I)x} _C_1 + e^{(-1.605043404 + 0.4948590386I)x} _C_2 \quad (3)$$

$$+ e^{(-1.605043404 - 0.4948590386I)x} _C_3 + e^{(0.6050434043 - 0.8350786687I)x} _C_4$$

```
> # Complex roots: .6050434043 \pm .8350786687*I
> # Complex roots: -1.605043404 \pm .4948590386*I
> # What are the Euler solution atoms for this equation?
```