```
> restart;
```

- Load from http://www.ccas.ru/ca/_media/truncatedseries2020.zip the archive with two files: maple.ind and maple.lib.
- Put these files to some directory, for example to ”/usr/userlib”.
- Assign libname := ”/usr/userlib”, libname in the Maple session.

```
> libname := "/usr/userlib/maple.lib", libname :
> with(TruncatedSeries);
```

$$[FormalSolution, LaurentSolution, RegularSolution] \quad (1)$$

```
>
> eq1 := (-1 + x + x^2 + O(x^3)) * theta(y(x), x, 2) - (2 + O(x^3)) * theta(y(x), x, 1) + Sum((i^2 + 2 * i
    + 1 - (i + 1)^2) * x^i, i = 4 ..infinity) * y(x);
```

$$eq1 := \left(-1 + x + x^2 + O(x^3)\right) \theta(y(x), x, 2) - \left(2 + O(x^3)\right) \theta(y(x), x, 1) + \left(\sum_{i=4}^{\infty} \left(i^2 + 2i + 1 - (i + 1)^2\right) x^i\right) y(x) \quad (2)$$

```
> LaurentSolution(eq1, y(x),
        'top'= 7, 'threshold'='h');
```

$$\left[\frac{\_c_1}{x^2} - \frac{4\,\_c_1}{x} + \_c_2 + O(x),\ \_c_2 + O\left(x^8\right)\right] \quad (3)$$

```
> h;
```

$$FAIL \quad (4)$$

```
> eq2 := (x^7 + x^5) * diff(y(x), x$4) + (18 * x^4 + Sum((-1)^k * x^k / k!, k = 7 ..infinity)) * diff(y(x), x
    $3) + (96 * x^3 + O(x^6)) * diff(y(x), x$2) + (168 * x^2 + O(x^5)) * diff(y(x), x) + 72 * x * y(x);
```

$$eq2 := \left(x^7 + x^5\right) \left(\frac{d^4}{dx^4} y(x)\right) + \left(18 x^4 + \left(\sum_{k=7}^{\infty} \frac{(-1)^k x^k}{k!}\right)\right) \left(\frac{d^3}{dx^3} y(x)\right) + \left(96 x^3 + O\left(x^6\right)\right) \left(\frac{d^2}{dx^2} y(x)\right) + \left(168 x^2 + O\left(x^5\right)\right) \left(\frac{d}{dx} y(x)\right) + 72\, x\, y(x) \quad (5)$$

```
> RegularSolution(eq2, y(x), 'top'= 3, 'threshold'='h');
```

$$\left[\frac{-\frac{\_c_2}{420 x^2} + \frac{\_c_3}{x} + \_c_4 + O(x) + \ln(x)\left(\frac{\_c_1}{x} + \_c_2 - 30\, x\, \_c_1 + O\left(x^2\right)\right)}{x^2},\right. \quad (6)$$

$$\frac{-\frac{\_c_2}{420 x^2} + \frac{\_c_3}{x} + \_c_4 + O(x) + \ln(x)\left(\_c_2 - \frac{5 x^2\, \_c_2}{3} + O\left(x^3\right)\right)}{x^2},$$

$$\frac{\frac{\_c_3}{x} + \_c_4 + x\left(-30\, \_c_3 + \frac{197\, \_c_1}{2}\right) + O\left(x^2\right) + \ln(x)\left(\frac{\_c_1}{x} - 30\, x\, \_c_1 + O\left(x^2\right)\right)}{x^2},$$

$$\frac{\frac{\_c_3}{x} + \_c_4 - 30\, x\, \_c_3 + O\left(x^2\right)}{x^2},\ \frac{\_c_4 + \frac{197\, x\, \_c_1}{2} + O\left(x^2\right) + \ln(x)\left(\frac{\_c_1}{x} - 30\, x\, \_c_1 + O\left(x^2\right)\right)}{x^2},$$

$$\left.\frac{\_c_4 - \frac{5 x^2\, \_c_4}{3} + O\left(x^3\right)}{x^2},\ \frac{\frac{197\, x\, \_c_1}{2} + O\left(x^2\right) + \ln(x)\left(\frac{\_c_1}{x} - 30\, x\, \_c_1 + O\left(x^2\right)\right)}{x^2}\right]$$

```
> h;
```

$$2 \quad (7)$$

> eq3 := (x^4 + O(x^7)) * theta(y(x), x, 3) + (3·x + O(x^5)) * theta(y(x), x, 2) + (1 + Sum(i * x^i, i = 1 ..infinity)) * theta(y(x), x, 1) = 0;

$$eq3 := \left(x^4 + O\left(x^7\right)\right) \theta(y(x), x, 3) + \left(3\,x + O\left(x^5\right)\right) \theta(y(x), x, 2) + \left(1 + \left(\sum_{i=1}^{\infty} i\,x^i\right)\right) \theta(y(x), x, 1) = 0 \quad \textbf{(8)}$$

>

> FormalSolution(eq3, y(x), 'threshold'='h');

$$\left[\_c_1 + O(x) + e^{\frac{1}{3\,x}}\, x^{2/3} \left(\_c_2 + \frac{35\,\_c_2\,x}{27} + \frac{8947\,\_c_2\,x^2}{1458} + O\left(x^3\right)\right) + e^{\frac{1}{x^3} - \frac{1}{3\,x}}\, y_{reg}(x)\right] \quad \textbf{(9)}$$

> h;

FAIL **(10)**

> FormalSolution(eq3, y(x), 'threshold'='h','top'= 10);

$$\left[\_c_1 + O\left(x^{11}\right) + e^{\frac{1}{3\,x}}\, x^{2/3} \left(\_c_2 + \frac{35\,\_c_2\,x}{27} + \frac{8947\,\_c_2\,x^2}{1458} + O\left(x^3\right)\right) + e^{\frac{1}{x^3} - \frac{1}{3\,x}}\, y_{reg}(x)\right] \quad \textbf{(11)}$$

> h;

FAIL **(12)**

>