> #Please do not post homework
#Shreya Ghosh, 9-13-2021, Assignment #3
#1. k=2
$dsolve(\{D(D(y))(t) - y(t) = 0, y(0) = 1, D(y)(0) = 0\}, y(t));$

$$y(t) = \frac{e^t}{2} + \frac{e^{-t}}{2} \quad (1)$$

> #1. k=3
$dsolve(\{D(D(D(y)))(t) - y(t) = 0, y(0) = 1, D(y)(0) = 0, D(D(y))(0) = 0\}, y(t));$

$$y(t) = \frac{e^t}{3} + \frac{2\,e^{-\frac{t}{2}} \cos\left(\frac{\sqrt{3}\,t}{2}\right)}{3} \quad (2)$$

> #1. k=4
$dsolve(\{D(D(D(D(y))))(t) - y(t) = 0, y(0) = 1, D(y)(0) = 0, D(D(y))(0) = 0, D(D(D(y)))(0) = 0\}, y(t));$

$$y(t) = \frac{e^t}{4} + \frac{e^{-t}}{4} + \frac{\cos(t)}{2} \quad (3)$$

> #1. k=5
$dsolve(\{D(D(D(D(D(y)))))(t) - y(t) = 0, y(0) = 1, D(y)(0) = 0, D(D(y))(0) = 0, D(D(D(y)))(0) = 0, D(D(D(D(y))))(0) = 0\}, y(t));$

$$y(t) = \frac{256\,e^t}{(40 + 8\sqrt{5})(40 - 8\sqrt{5})} + \frac{(16\sqrt{5} + 16)\sqrt{5}\,e^{\left(-\frac{\sqrt{5}}{4} - \frac{1}{4}\right)t} \cos\left(\frac{\sqrt{2}\sqrt{5 - \sqrt{5}}\,t}{4}\right)}{5(40 + 8\sqrt{5})} - \frac{\sqrt{5}\,(16 - 16\sqrt{5})\,e^{\left(\frac{\sqrt{5}}{4} - \frac{1}{4}\right)t} \cos\left(\frac{\sqrt{2}\sqrt{5 + \sqrt{5}}\,t}{4}\right)}{5(40 - 8\sqrt{5})} \quad (4)$$

> #1. k=6
$dsolve(\{D(D(D(D(D(D(y))))))(t) - y(t) = 0, y(0) = 1, D(y)(0) = 0, D(D(y))(0) = 0, D(D(D(y)))(0) = 0, D(D(D(D(y))))(0) = 0, D(D(D(D(D(y)))))(0) = 0\}, y(t));$

$$y(t) = \frac{e^t}{6} + \frac{e^{-t}}{6} + \frac{e^{-\frac{t}{2}} \cos\left(\frac{\sqrt{3}\,t}{2}\right)}{3} + \frac{e^{\frac{t}{2}} \cos\left(\frac{\sqrt{3}\,t}{2}\right)}{3} \quad (5)$$

> #1. k=7
$dsolve(\{D(D(D(D(D(D(D(y)))))))(t) - y(t) = 0, y(0) = 1, D(y)(0) = 0, D(D(y))(0) = 0, D(D(D(y)))(0) = 0, D(D(D(D(y))))(0) = 0, D(D(D(D(D(y)))))(0) = 0, D(D(D(D(D(D(y))))))(0) = 0\}, y(t));$
#maple not computing past k=6

> #1. y(1)

$Y := dsolve(\{D(D(y))(t) - y(t) = 0, y(0) = 1, D(y)(0) = 0\}, y(t));$

$$Y := y(t) = \frac{e^t}{2} + \frac{e^{-t}}{2} \quad \textbf{(6)}$$

> $eval(Y, t = 1);$

$$y(1) = \frac{e}{2} + \frac{e^{-1}}{2} \quad \textbf{(7)}$$

> #3.

#a(2)=3·3-2·2=5

#a(3)=3·5-2·3=9

#a(4)=3·9-2·5=17

#3-2=1, 5-3=2, 9-5=4, 17-9=8 --> 2^n

#a(n)=1 +2^n

$rsolve(\{a(n) = 3 \cdot a(n-1) - 2 \cdot a(n-2), a(0) = 2, a(1) = 3\}, a(n));$

$$1 + 2^n \quad \textbf{(8)}$$

> #4.

$rsolve(\{a(n) = 2 \cdot a(n-1) + 2 \cdot a(n-2) - 2 \cdot a(n-3), a(0) = 3, a(1) = 2, a(2) = 6\}, a(n));$

$$\sum_{\_R = RootOf(2\_Z^3 - 2\_Z^2 - 2\_Z + 1)} \left(- \frac{(-4\_R^2 - 4\_R + 3)\left(\frac{1}{\_R}\right)^n}{(6\_R^2 - 4\_R - 2)\_R} \right) \quad \textbf{(9)}$$

> #5.

$rsolve(\{a(n) = a(n-4), a(0) = 1, a(1) = 0, a(2) = 0, a(3) = 0\}, a(n));$

$$\frac{(-1)^n}{4} + \frac{1}{4} + \frac{(-I)^n}{4} + \frac{I^n}{4} \quad \textbf{(10)}$$

> #2.

$2^{2^n} = \left(2^{2^{n-1}}\right)^2$

$2^{2^n} = \left(2^{2^n \cdot 2^{-1}}\right)^2$

$2^{2^n} = 2^{2^n}$

The constant multiple of the solution is not also a solution because the recurrence is nonlinear.

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