1. Use Maple to solve the following initial value problem differential equations for $2 \leq k \leq 10$

$y^{(k)}(t)-y(t)=0$ ; $y(0)=1$ , $y'(0)=0$ , ... , $y^{(k-1)}(0)=0$ . and then find the value (in decimals) of y(1). Do you see a trend?

y2= dsolve({D(D(y)(t)-y(t)=0, y(0)=1, D(y)(0)=0}, numeric)

y2(1)[2];

y3= dsolve({D(D(y)(t)-y(t)=0, y(0)=1, D(y)(0)=, 0, D(D(y))(0)=0}, numeric)

y3(1)[2];

y4= dsolve({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}, numeric)

y4(1)[2];

2. (a) Prove that $a_1(n) = 2^{2^n}$ satisfies the non-linear recurrence equation $a(n) = a(n-1)^2$ .

Is the following constant multiple of the sequence $a_1(n)$, given by $a_2(n) = 3 \cdot 2^{2^n}$ , also a solution? Why?

3. Doing it both by hand and via Maple, solve the following recurrence with the given initial conditions

$a(n) = 3a(n-1)-2a(n-2)$ ; $a(0) = 2$ , $a(1) = 3$ .

rsolve({a(n)-3*a(n-1)+2*a(n-2)=0, a(0)=2, a(1)=3}, a(n));

2^n+1

5. Doing it both by hand and via Maple solve the recurrence with the initial conditions

$a(n)=a(n-4)$ ; $a(0)=1, a(1)=0, a(2)=0, a(3)=0$ .

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

¼+((-I^n)/4)+(I^n/4)+((-I^n)/4)