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## Dynamic Modeling Homework 1

$$1) F(n, p_1, p_2, p_3, c_0, c_1, c_2) = p_1^* F(n-1, p_1, p_2, p_3, c_0, c_1, c_2) + \\ p_2^* F(n-2, p_1, p_2, p_3, c_0, c_1, c_2) + \\ p_3^* F(n-3, p_1, p_2, p_3, c_0, c_1, c_2)$$

@ n=4

$$n-1 \Rightarrow 4-1=3 \rightarrow \text{must find}$$

$$n-2 \Rightarrow 4-2=2 \rightarrow @ \overline{n=2}, F(n, p_1, p_2, p_3, c_0, c_1, c_2) = c_2$$

$$n-3 \Rightarrow 4-3=1 \rightarrow @ n=1, F(n, p_1, p_2, p_3, c_0, c_1, c_2) = c_1$$

@ n=3

$$n-1=3-1=2 \rightarrow @ n=2, F(n, p_1, p_2, p_3, c_0, c_1, c_2) = c_2$$

$$n-2=3-2=1 \rightarrow @ n=1, F(n, p_1, p_2, p_3, c_0, c_1, c_2) = c_1$$

$$n-3=3-3=0 \rightarrow @ n=0, F(n, p_1, p_2, p_3, c_0, c_1, c_2) = c_0$$

$$\rightarrow F(3, p_1, p_2, p_3, c_0, c_1, c_2) = c_2 + c_1 + c_0$$

$$F(4, p_1, p_2, p_3, c_0, c_1, c_2) = p_1^* (c_2 + c_1 + c_0) + p_2^* (c_2) + p_3^* (c_1)$$

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> #OK to post homework
#Nikita John, September 6th, 2021, Assignment 1
> #2: Function written symbolically
F :=proc(n, p1, p2, p3, c0, c1, c2) option remember
if n = 0 then
  c0 :
elif n = 1 then
  c1 :
elif n = 2 then
  c2 :
else
  expand(p1·F(n - 1, p1, p2, p3, c0, c1, c2) + p2·F(n - 2, p1, p2, p3, c0, c1, c2, c3) + p3·F(n
    - 3, p1, p2, p3, c0, c1, c2)) :
fi:
end:
> #3: Part 1 - Extinction
seq(F(i, 0.4, 0.2, 0.15, 1, 1, 1), i = 1000)
2.972192112 10-73 (1)

> #3: Part 2 - Stable Population
seq(F(i, 0.4, 0.5, 0.1, 1, 1, 1), i = 990 .. 1010)
1.000000000, 1.000000000, 1.000000000, 1.000000000, 1.000000000, 1.000000000,
1.000000000, 1.000000000, 1.000000000, 1.000000000, 1.000000000, 1.000000000,
1.000000000, 1.000000000, 1.000000000, 1.000000000, 1.000000000, 1.000000000,
1.000000000, 1.000000000, 1.000000000, 1.000000000, 1.000000000, 1.000000000
(2)

> #3: Part 3 - Explosion
seq(F(i, 0.75, 0.2, 0.3, 1, 1, 1), i = 1000)
6.198505684 1060 (3)
>

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