#ATTENDANCE QUIZ FOR LECTURE 3 of Dr. Z.'s Math336 Rutgers University

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#Subject: p3

#Right after attending the lecture, but no later than 4:00pm that day

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LIST ALL THE ATTENDANCE QUESTIONS FOLLOWED (IF YOU KNOW THEM) BY THE ANSWERS

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#
#ATTENDMACE QUESTION NUMBER 1: SIR model
#
#
#Property 1: If y1(t) is a solution that so is C*y1(t) for any constant
#
#FORMAT OF A LINEAR DIFFERENTIAL EQUATION IS

#a0(t)*y(t)+a1(t)*y'(t)+...+ ak(t)*y^(k)(t)=0 GENERAL LINEAR DIFF. EQ.
#
#a0(t)*(C*y1)(t)+a1(t)*(C*y1)'(t)+...+ ak(t)*(C*y1)^(k)(t)=0
> #C*(a0(t)*(y1)(t)+a1(t)*(y1)'(t)+...+ ak(t)*(y1)^(k)(t))=0
#
#ATTENDANCE QUESTION 2:
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#
#ATTENDANCE QUESTION 2:
#
#WHY IS THIS PROPERTY NOT TRUE FOR y'(t)=y(t)^2
#
#Lemma 2: If y1(t) and y2(t) are two different solutions of a LINEAR (HOMOG.) Diff. Eq. THEN
#y1(t)+y2(t)
#
#a0(t)*y1(t)+a1(t)*y1'(t)+...+ ak(t)*y1^(k)(t)=0
##a0(t)*y2(t)+a1(t)*y2'(t)+...+ ak(t)*y2^(k)(t)=0
#HTP:
#a0(t)*(y1(t)+y2(t))+a1(t)*(y1(t)+y2(t))'+...+ ak(t)*(y1(t)+y2(t))^(k)=0
##a0(t)*(y1(t)+y2(t))+a1(t)*(y1'(t)+y2'(t))+...+ ak(t)*(y1^(k)(t)+y2^(k)(t))=0
#
#
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> #
  #NEXT ATTENDANCE QUESTION:
  #a1:=the fifth digit of your DUID (if it 0 make it 1)
  #a2:=the first digit
  #a3:=second digit

> #solve by hand and Maple the diff. eq.
  #a1*y''(t)-a2*y'(t)+a3*y(t)=0,  y(0)=0, y'(0)=0
  #
  #
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#NEXT ATTENDANCE QUESTION: WHY IS THE PROERPTY THAT IF a(n) is  a solution so is C*a(n) not valid for
#the NON-LINEAR RECURRENCE
#a(n)=a(n-1)^2
#
#a(n)=r^n: TRIAL SOLUTION
#
#r^n-5*r^(n-1)+6*r^(n-2)=0
#
#(1-5*r^(-1)+6)*r^(-2))*r^n=0 DIVIDE by r^(n-2)
#
#REPLACE a(n) by 1,a(n-1) by 1/r  a(n-2) by 1/r^2 etc.
 #
 #CHARACTERISTIC EQUATION FOR the CONSTANT COEFF. LINEAR HOMOG. DIFFERENCE EUQATION
 #
 #1-5/r+6/r^2=0
> #r^2-5*r+6=0
 #(r-3)*(r-2)=0  r=2, r=3
 #
 #G.S. a(n)= C1*2^n + C2*3^n C1,C2, tbd
 #
 #1=C1+C2     5=2*C1+3*C2
 solve({C1+C2=1, 2*C1+3*C2=5},{C1,C2});
```

$$\{C1 = -2, C2 = 3\}$$