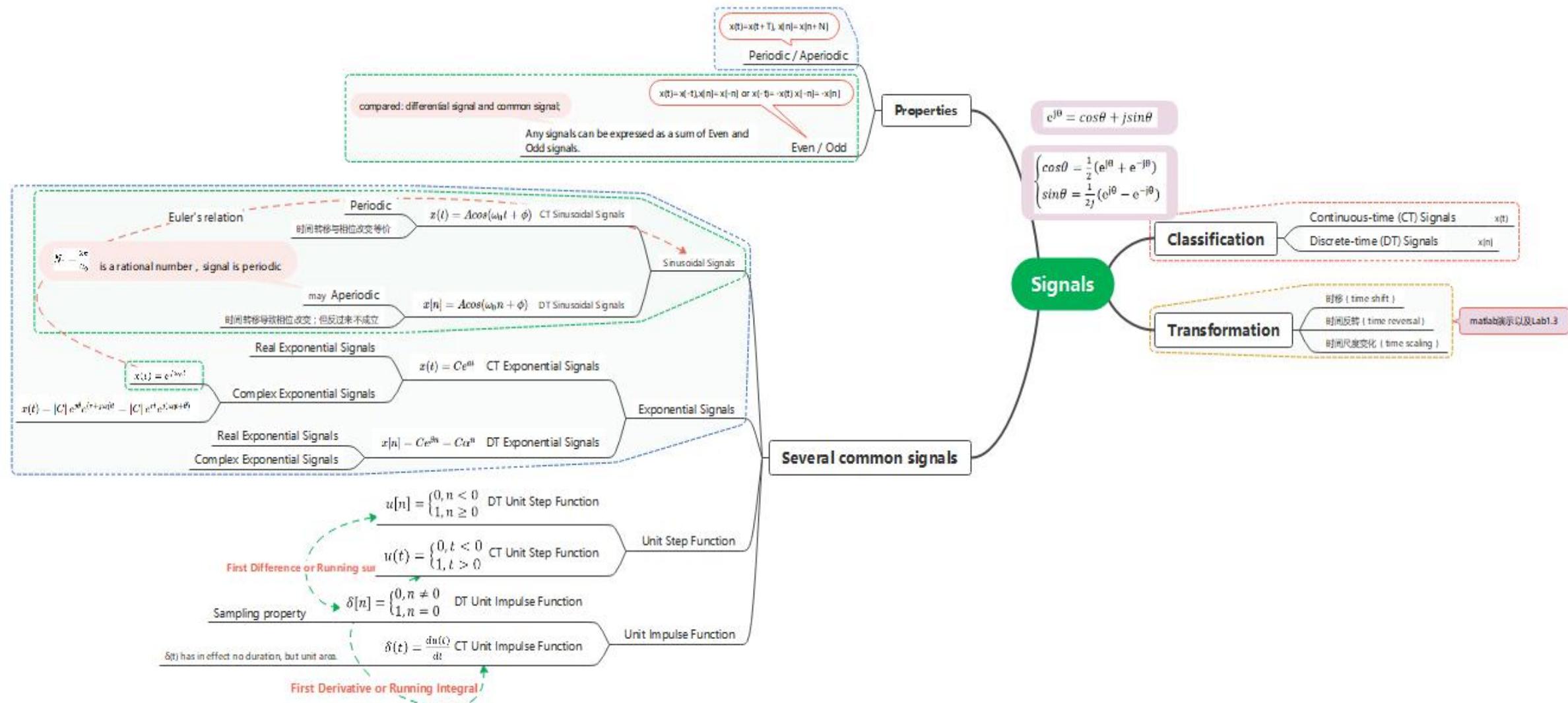


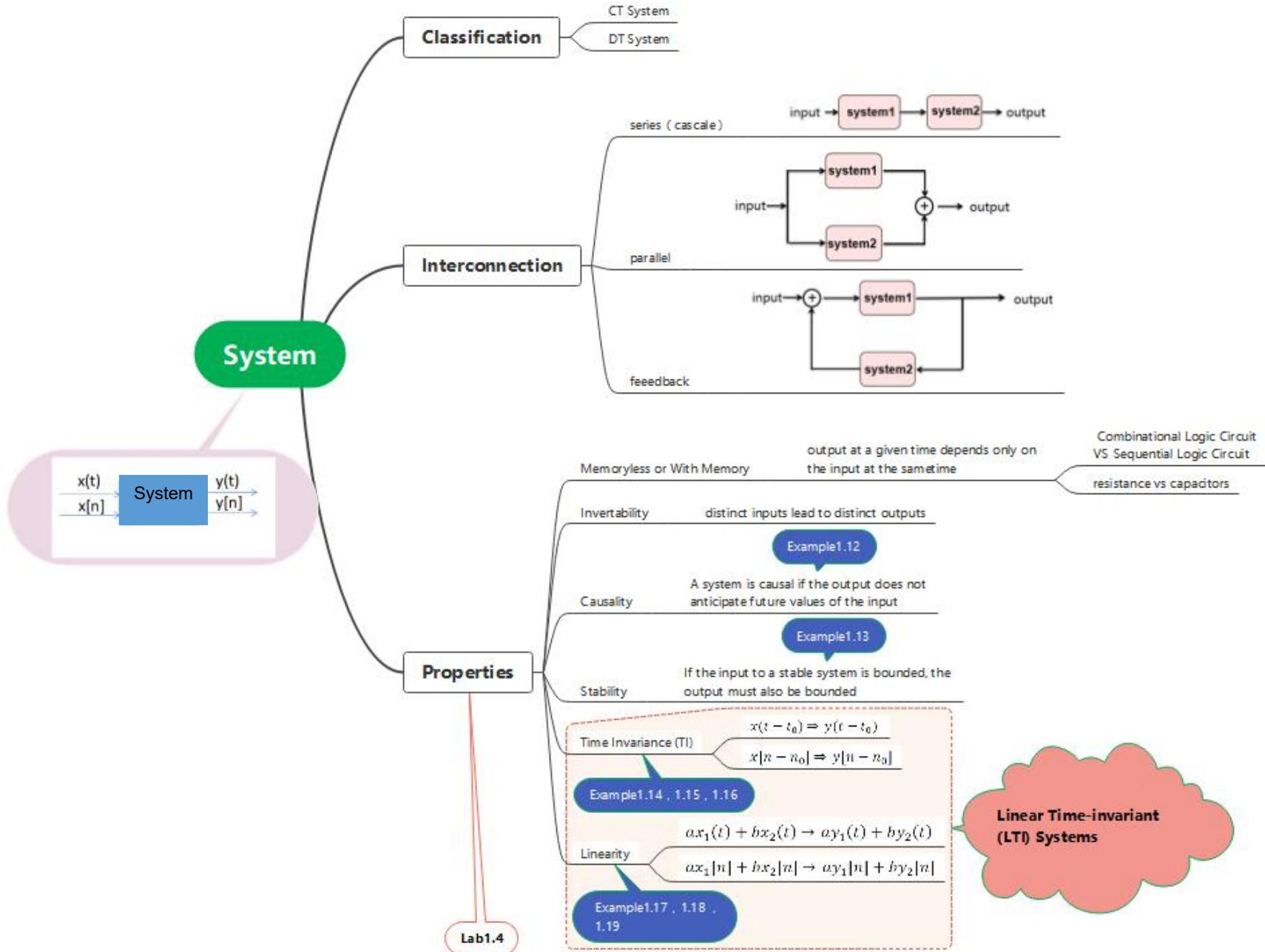
# 信号与系统实验



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办公地点：慧园2栋411

# Part 3: Chapter1 of Signals and Systems





# Demonstrate How the System Violate One Property

Linearity: Lab1.4 a)

Steps

- 1) Given inputs  $x_1[n]$ --nx1,  $x_2[n]$ --nx2
- 2) Calculate  $y_1[n]$ --ny1 and  $y_2[n]$ --ny2 as output signals to  $x_1[n], x_2[n]$
- 3) Given input  $x_3[n] = a*x_1[n] + b*x_2[n]$ --nx3
- 4) Calculate  $y_3[n]$ --ny3 as output signals to  $x_3[n]$
- 5) Compare  $y_3[n]$  with  $a*y_1[n] + b*y_2[n]$ , hold on , legend

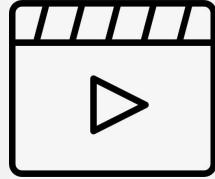
Not equal -----Not Linear

Time-invariance Lab1.4 f) g)

Steps:

- 1) Given inputs  $x_1[n]$ --nx1
- 2) Calculate  $y_1[n]$ --ny1 as output signals to  $x_1[n]$
- 3) Given input  $x_2[n] = x_1[n+N]$  ---nx2
- 4) Calculate  $y_2[n]$  --ny2 as output signals to  $x_2[n]$
- 5) Compare  $y_2[n]$  with  $y_1[n+N]$

Not equal ---- Not Time-Invariant

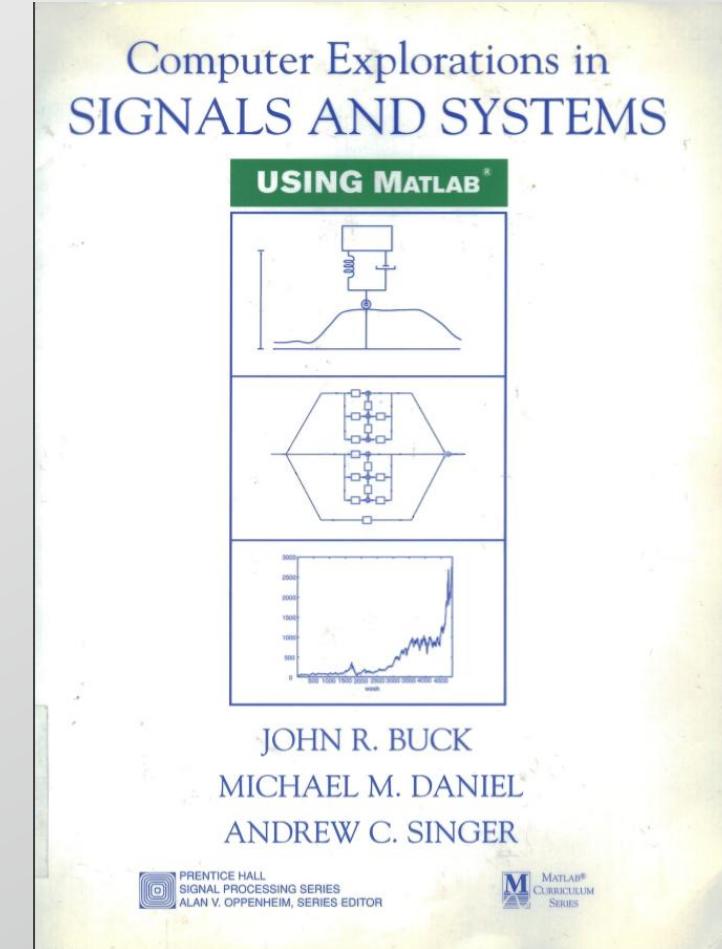


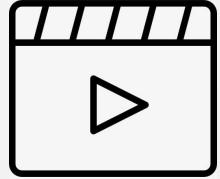
# Lab1 Assignments

- 1.4 (a~d) & 1.5(a~d)

## Tips :

- 1 The index value of the matrix element should be enclosed in parentheses () and start from 1;





# 作业要求

- ✓ 提交一份pdf文件，一个源文件的压缩包；  
两人一组，一人上传即可；
- ✓ 实验报告格式：课上详解
- ✓ pdf文件可由实时脚本直接另存为；
- ✓ 如果有多个文件，合并为一个pdf；

# LAB1 第一章 信号与系统

学生1姓名 学号 + 学生2姓名 学号

通过本实验的练习，掌握了以下技能：

1：应用几个常用的matlab函数，来表示连续信号和离散信号； **10%**

2：使用图形语句直观化的展示信号及其处理结果；

.....

.....

## 作业内容 **70%**

1.4a，题目要求利用单位冲激函数证明系统  $y[n]$ 违反线性。

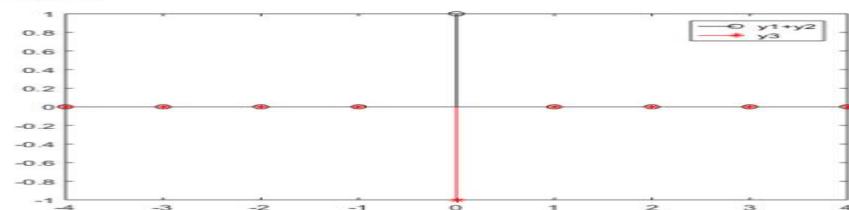
```
y1[n]=sin( pi/2) *x1[n] )
```

```
y2[n]=sin( pi/2) *x2[n] )
```

```
y3[n]=sin( pi/2) *(x1[n]+x2[n]))
```

分析： $x_3 = x_1 + x_2$ ，所以将  $y_1 + y_2$  与  $y_3$  做对比，如果  $y_1 + y_2 \neq y_3$ ，则证明不符合线性；故绘制出  $y_1+y_2$  和  $y_3$  的信号图像进行对比：

```
clc,clear,close all
%构建出x1, x2, x3, y1, y2, y3
nx=-4:1:4;
x1=[0 0 0 1 0 0 0 0];
x2=[0 0 0 0 2 0 0 0];
x3=x1+x2;
y1=sin(pi/2*x1);
y2=sin(pi/2*x2);
y3=sin(pi/2*x3);
%绘制y1+y2及y3, 进行比对
figure
stem(nx,y1+y2,'k','o'),hold on, stem(nx,y3,'r','*')
legend('y1+y2','y3')
```



结论： $y_1 + y_2 \neq y_3$ ，故不满足线性的要求；

## 课堂参与证明：( Experience )

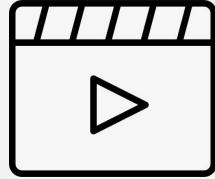
课上互动题目的截图，每位同学一张

**20%**

## 自我评分：( Score )

学生1姓名 自评分

学生2姓名 自评分



# Requirements

- ✓ Submit a pdf file, a zip file of the source file;
- ✓ Two students in a group, only one submit homework; **Check again !**
- ✓ Lab report format: detailed explanation in class;
- ✓ Live Scripts can be directly saved as PDF/doc file;
- ✓ If there are multiple files, merge them into one pdf;

**After completing this lab, I'm able to,****10%**

1. Apply several commonly used matlab functions to represent continuous signals and discrete signals;
  2. Use graphic statements to intuitively display signals and their processing results;
- .....
- .....

**Assignment 70%**

1.4a , It is required to prove that system  $y[n]$  violates linearity by using unit impulse function.

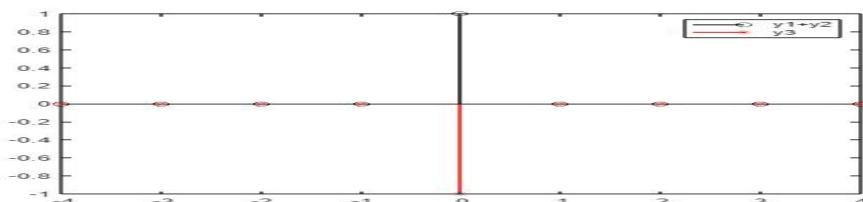
$$y_1[n] = \sin(\pi/2)x_1[n]$$

$$y_2[n] = \sin(\pi/2)x_2[n]$$

$$y_3[n] = \sin(\pi/2)(x_1[n] + x_2[n])$$

**Analysis :** let  $x_3 = x_1 + x_2$  , and compare  $y_1 + y_2$  and  $y_3$ . If  $y_1 + y_2 \neq y_3$ , It is proved that the system is not linear ; So just draw and compare the signal image of  $y_1+y_2$  and  $y_3$ :

```
clc,clear,close all
%构建出x1, x2, x3, y1, y2, y3
nx=-4:1:4;
x1=[0 0 0 1 0 0 0 0];
x2=[0 0 0 0 2 0 0 0 0];
x3=x1+x2;
y1=sin(pi/2*x1);
y2=sin(pi/2*x2);
y3=sin(pi/2*x3);
%绘制y1+y2及y3, 进行比对
figure
stem(nx,y1+y2, 'ko'), hold on, stem(nx,y3, 'r*')
legend('y1+y2', 'y3')
```



**Conclusion:** we can see  $y_1 + y_2 \neq y_3$  from the above figure, so the system is not linear.

**Experience 20%**

A screenshot of the interactive questions in the class, one for each student.

**Score**

student1 name Self-assessment score

student1 name Self-assessment score