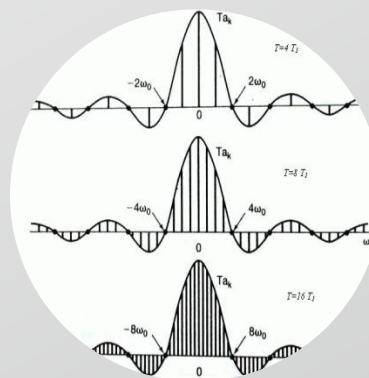
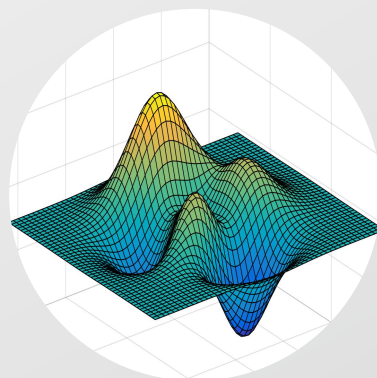
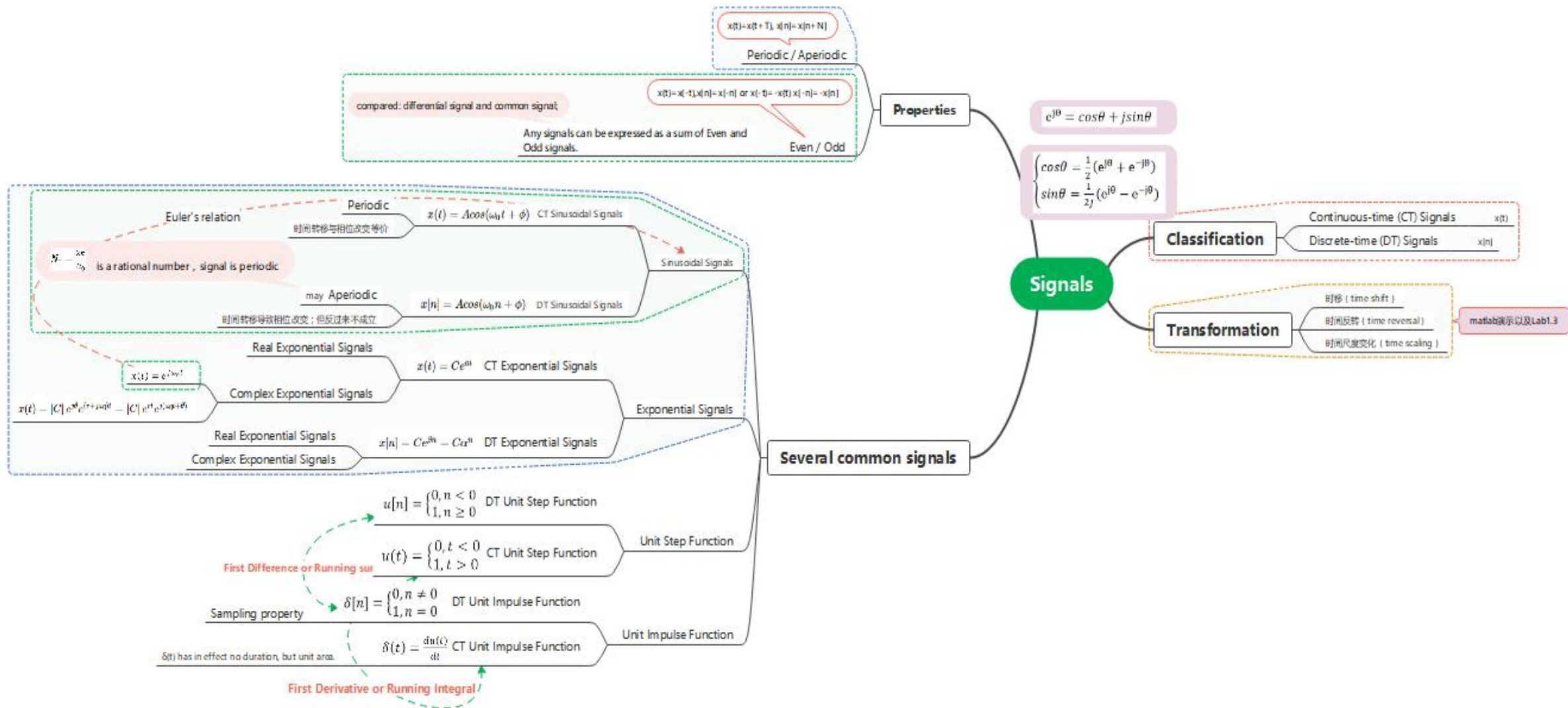


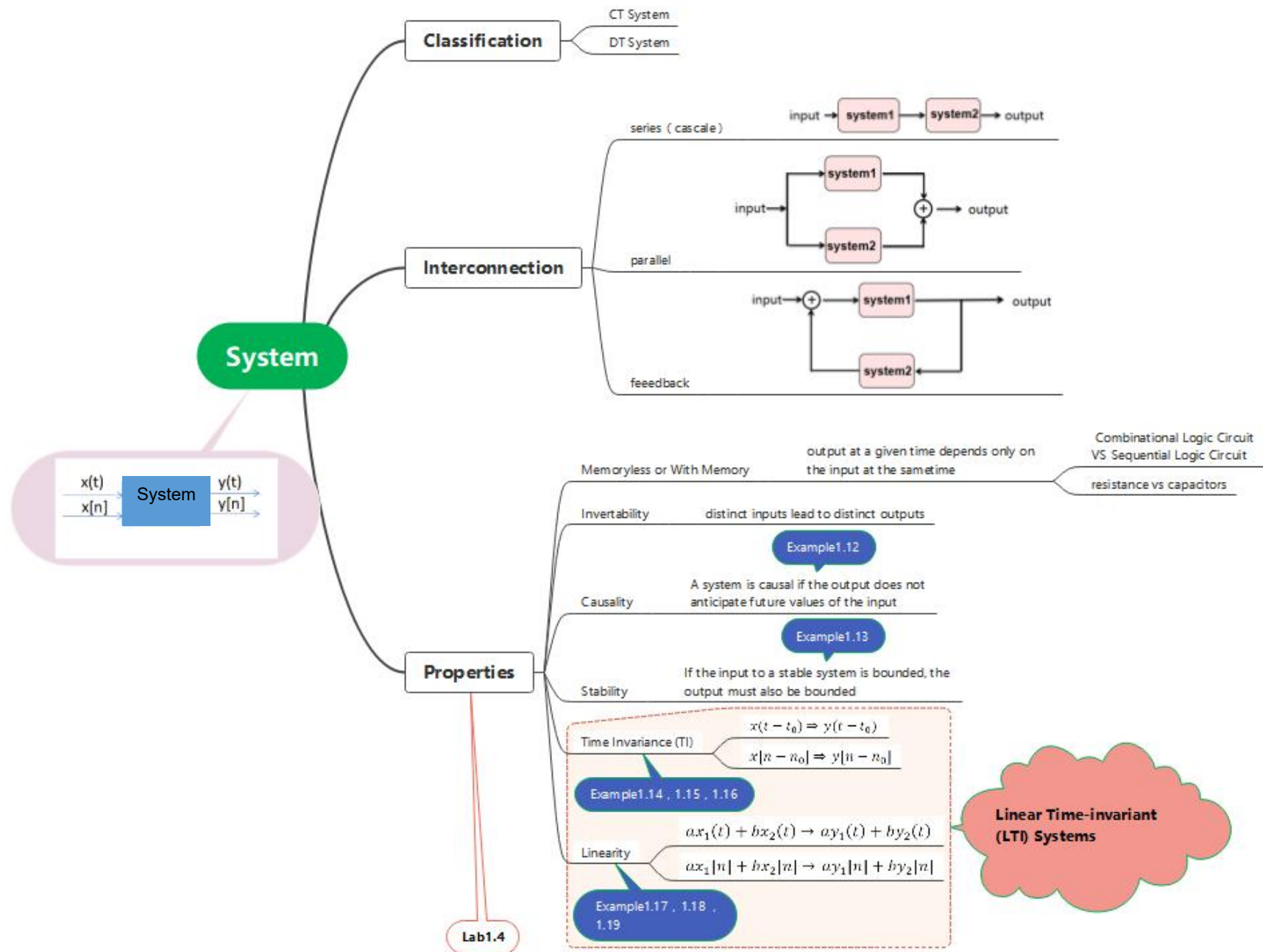
信号与系统实验



主讲老师：王小静
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 $x1[n]$ -- $nx1$, $x2[n]$ -- $nx2$
- 2) Calculate $y1[n]$ -- $ny1$ and $y2[n]$ -- $ny2$ as output signals to $x1[n]$, $x2[n]$
- 3) Given input $x3[n] = a*x1[n] + b*x2[n]$ -- $nx3$
- 4) Calculate $y3[n]$ -- $ny3$ as output signals to $x3[n]$
- 5) Compare $y3[n]$ with $a*y1[n] + b*y2[n]$, hold on , legend

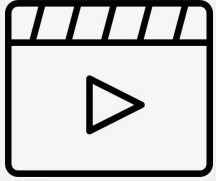
Not equal -----Not Linear

Time-invariance Lab1.4 f) g)

Steps:

- 1) Given inputs $x1[n]$ -- $nx1$
- 2) Calculate $y1[n]$ -- $ny1$ as output signals to $x1[n]$
- 3) Given input $x2[n] = x1[n+N]$ --- $nx2$
- 4) Calculate $y2[n]$ -- $ny2$ as output signals to $x2[n]$
- 5) Compare $y2[n]$ with $y1[n+N]$

Not equal ---- Not Time-Invariant



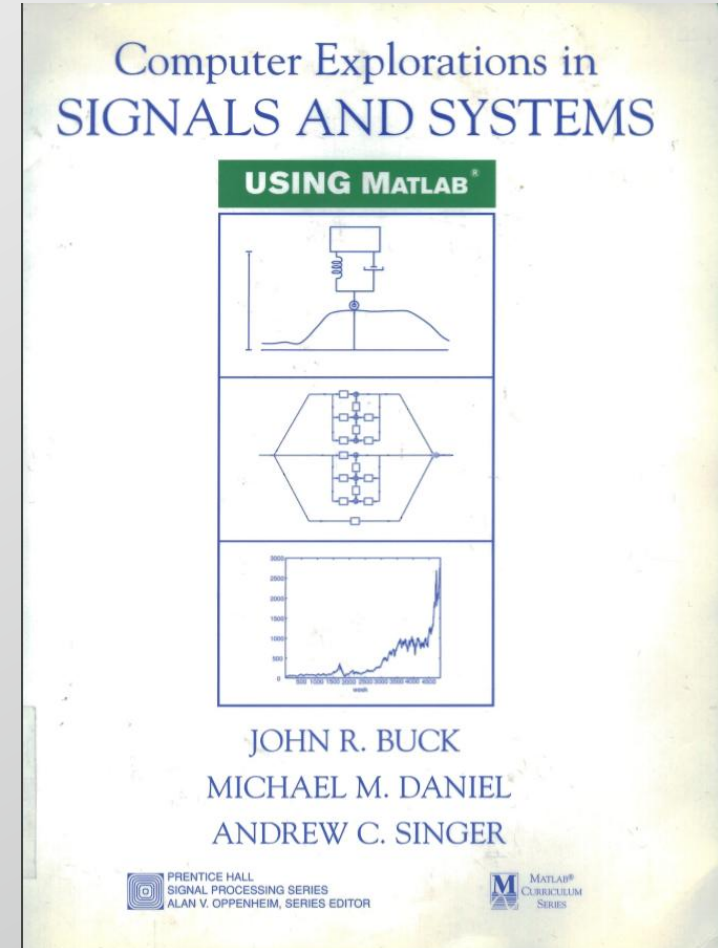
Lab1 Assignments

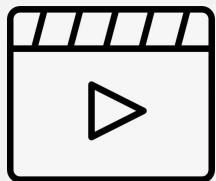
- 1.4 (a~d) & 1.5(a~d)

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；

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；

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.....

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。

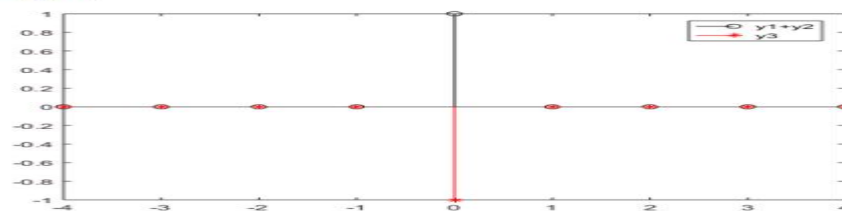
$y1[n] = \sin(\pi/2 \cdot x1[n])$

$y2[n] = \sin(\pi/2 \cdot x2[n])$

$y3[n] = \sin(\pi/2 \cdot (x1[n] + x2[n]))$

分析： $x3 = x1 + x2$ ，所以将 $y1 + y2$ 与 $y3$ 做对比，如果 $y1 + y2 \neq y3$ ，则证明不符合线性；故绘制出 $y1 + y2$ 和 $y3$ 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 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，进行对比
figure
stem(nx,y1+y2,'k','o'),hold on, stem(nx,y3,'r','*')
legend('y1+y2','y3')
```



结论： $y1 + y2 \neq y3$ ，故不满足线性的要求；

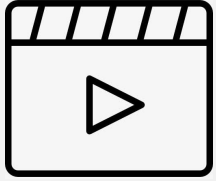
课堂参与证明：(Experience)

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;

LAB1 Signals and Systems

student1 name + ID number student2 name + ID number

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;

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Assignment 70%

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

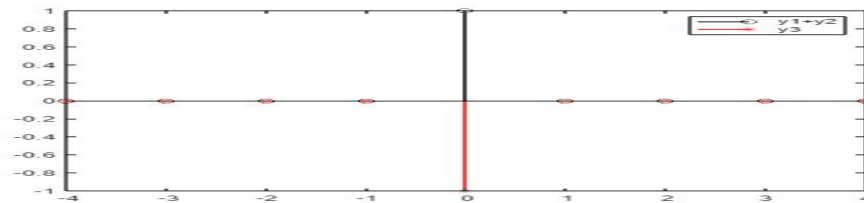
$y1[n] = \sin(\pi/2 \cdot x1[n])$

$y2[n] = \sin(\pi/2 \cdot x2[n])$

$y3[n] = \sin(\pi/2 \cdot (x1[n] + x2[n]))$

Analysis : let $x3 = x1 + x2$, and compare $y1 + y2$ and $y3$. If $y1 + y2 \neq y3$, It is proved that the system is not linear ; So just draw and compare the signal image of $y1+y2$ and $y3$:

```
clc,clear,close all
%构建出x1, x2, x3, y1, y2, y3
nx=-4:1:4;
x1=[0 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, 进行对比
figure
stem(nx,y1+y2,'ko'),hold on, stem(nx,y3,'r*')
legend('y1+y2','y3')
```



Conclusion: we can see $y1 + y2 \neq y3$ 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