# Lab B Homework

Due Monday Feb 2 Midnight.

# Problem B.1

- >> mean(dice(100))
- ans =
- 3.5100
- >> mean(dice(1000))
- ans =
- 3.4720
- >> mean(dice(10000))
- ans =
- 3.4708
- >> mean(dice(1000000))
- ans =
- 3.4988

Looking at the values I got as I increased the number of rolling the dice, the mean values get closer to 3.5. I can make a guess that the mean value of the dice converges to 3.5 as the number of rolling increases.

# Problem B.2

```
>> median(dice(100))
ans =
    3
>> median(dice(1000))
ans =
    3
>> median(dice(10000))
ans =
    4
>> median(dice(100000))
ans =
    3
>> median(dice(1000000))
ans =
    4
```

The median values are almost all times either 3 or 4 no matter how many times I rolled the dice.

```
>> mode(dice(100))
ans =
    5
>> mode(dice(1000))
ans =
    2
>> mode(dice(10000))
ans =
    5
>> mode(dice(100000))
ans =
    3
>> mode(dice(1000000))
ans =
    2
```

The mode values vary and there's no specific value with larger probability.

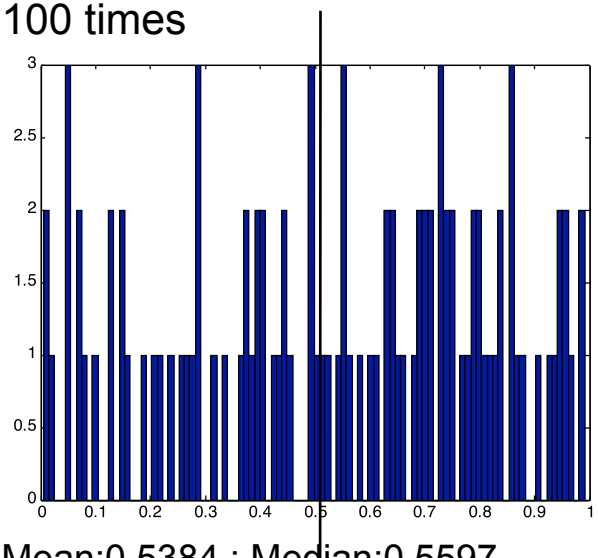
```
>> std(dice(100))
ans =
   1.6881
>> std(dice(1000))
ans =
   1.7369
>> std(dice(10000))
ans =
   1.7055
>> std(dice(100000))
ans =
   1.7035
>> std(dice(1000000))
ans =
   1.7079
```

The values of standard deviation converge to 1.7.

`max` and `min` function for rolling dice almost always give the value of 6 and 1. Because the definition of `max` and `min` functions are the maximum value and minimum value among the values I get, the values converge to 6 and 1.

# Problem B.3 – rand

100 times

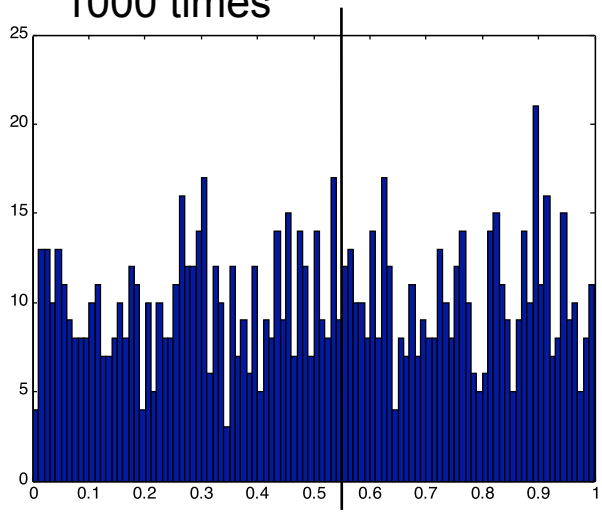


Mean:0.5384 ; Median:0.5597

Mode:0.0132 ; Std:0.2832

Max:0.9910 ; Min:0.0054

1000 times

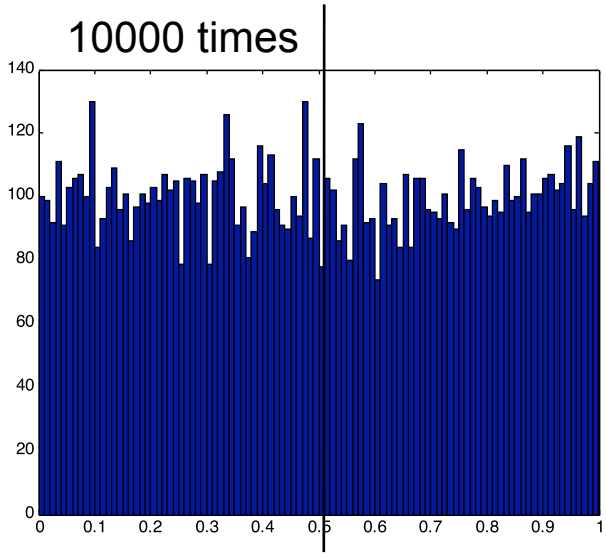


Mean:0.5080 ; Median:0.5120

Mode:3.5421e-004 ; Std:0.2870

Max:0.9994 ; Min:8.8725e-004

10000 times

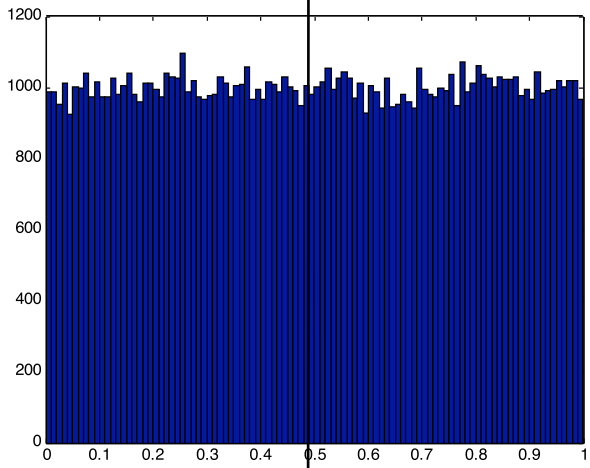


Mean:0.5011 ; Median:0.5058

Mode:0.1313 ; Std:0.2911

Max:0.9999 ; Min: 2.1313e-004

100000 times

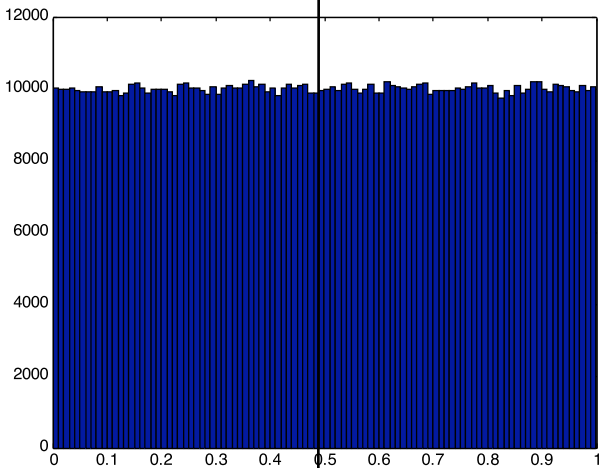


Mean:0.5008 ; Median:0.5009

Mode:6.7921e-004 ; Std:0.2886

Max:1 ; Min:9.2886e-006

1000000 times



Mean:0.5003 ; Median:0.5004

Mode:9.8353e-002 ; Std:0.2885

Max:1 ; Min:5.3344e-007

1.Mean converges to 0.5

2.Median converges to 0.5

3.Mode doesn't converge

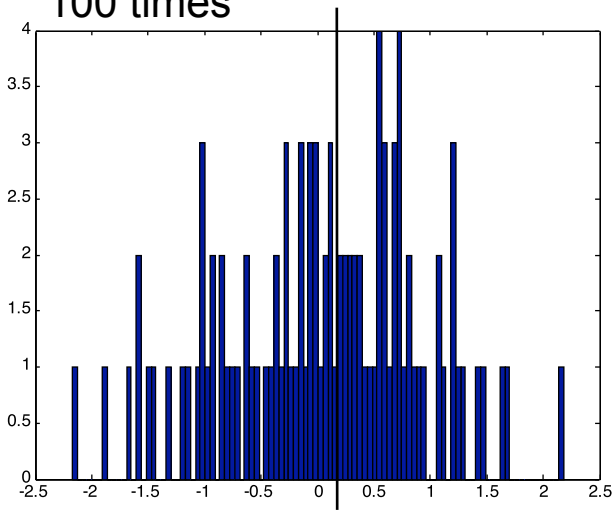
4.STD converges around 0.29

5. Max converges to 1

6. Min converges to 0

# Problem B.3 – randn

100 times

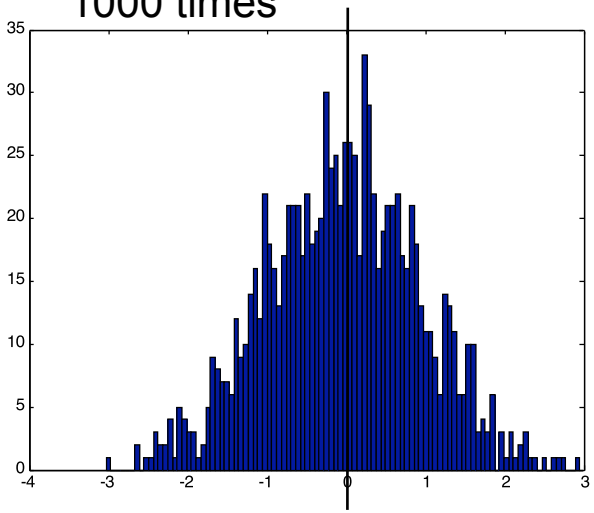


Mean:0.0479 ; Median:0.1162

Mode:0.6731 ; Std:0.8685

Max:2.1832 ; Min:-2.1707

1000 times

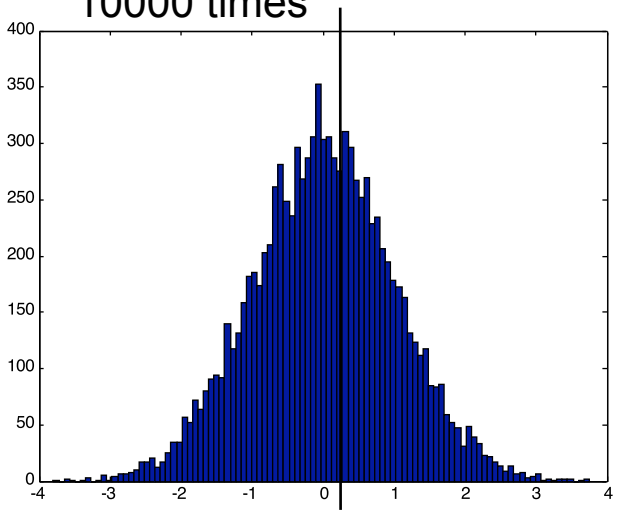


Mean:-0.0472 ; Median:-0.0264

Mode:0.3784 ; Std:0.9710

Max:2.9495 ; Min:-3.0291

10000 times

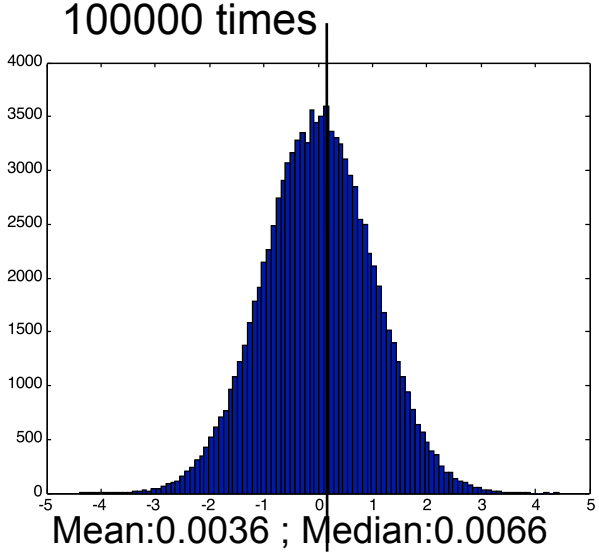


Mean:0.0094 ; Median:0.0043

Mode:-0.2643 ; Std:1.0052

Max:3.7476 ; Min: -3.7989

100000 times

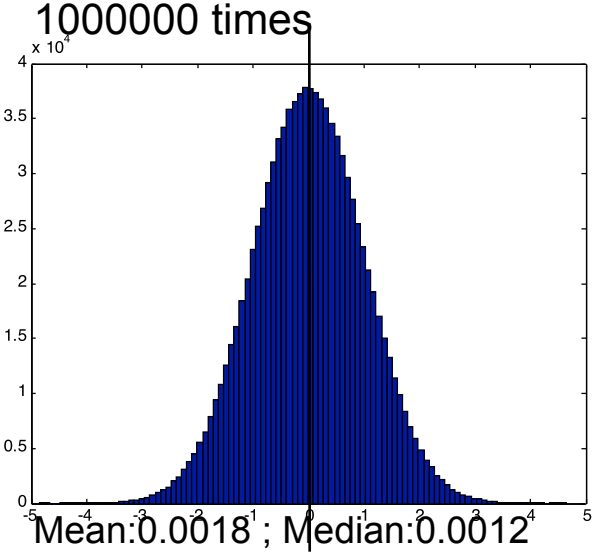


Mean:0.0036 ; Median:0.0066

Mode:0.0756 ; Std:1.0021

Max:4.4289 ; Min:-4.3926

1000000 times



Mean:0.0018 ; Median:0.0012

Mode:5.6034e-003; Std:1.0001

Max:4.6365 ; Min:-4.8521

1.Mean converges to 0

2.Median converges to 0

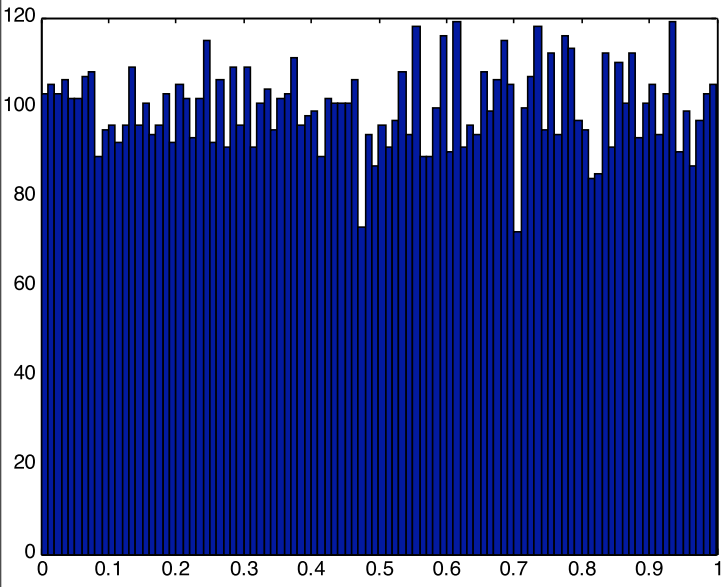
3.Mode converges to 0

4.STD converges to 1

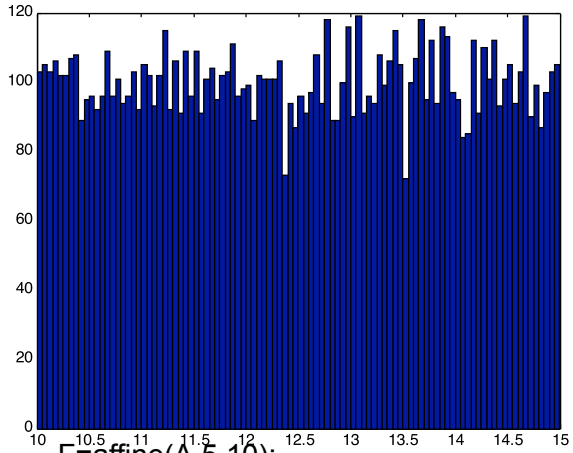
5. Max do not converge

6. Min do not converge

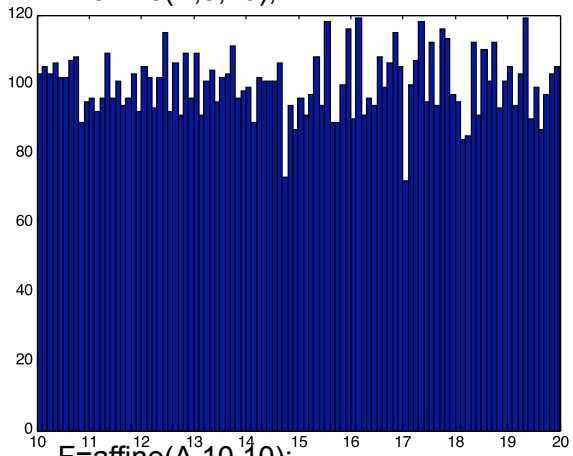
# Problem B.4-rand



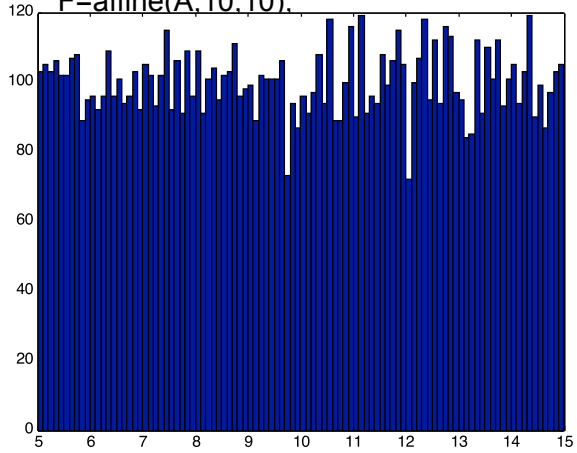

A=rand(10000,1);




F=affine(A,5,10);




F=affine(A,10,10);



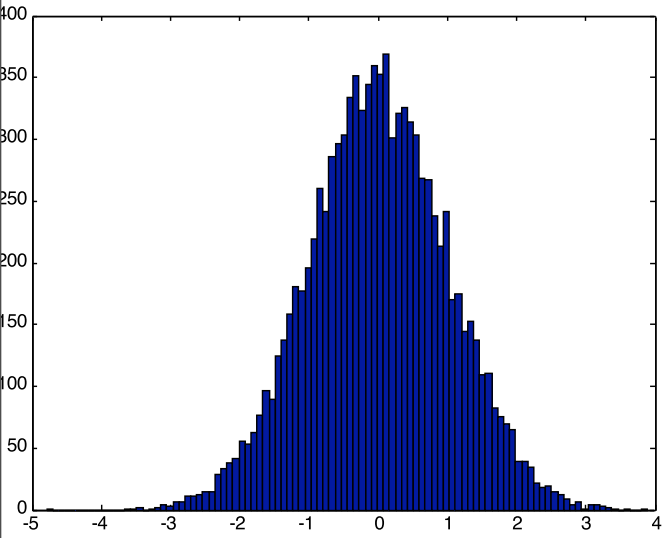

F=affine(A,10,5);

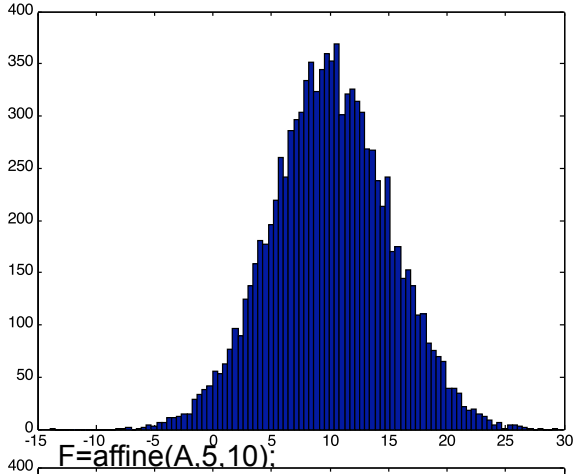
The shape and the y-axes are the same for all four histograms. However, the x-axes change according to the value of m and b.

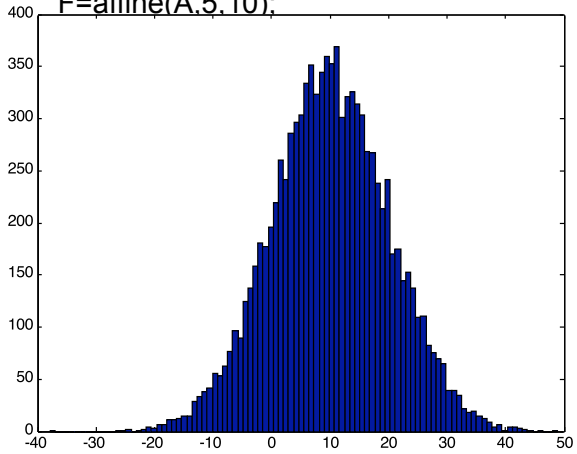
The range of x-axes is set to be from [b ~ b+m]

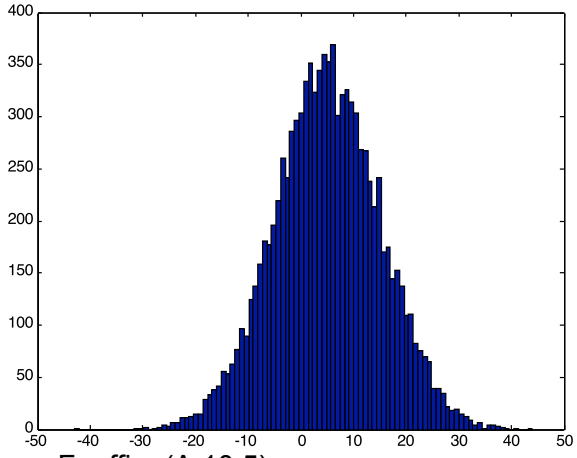
(Since the original domain of A is [0,1], the affined domain is [0*m+b,1*m+b]

# Problem B.4-randn



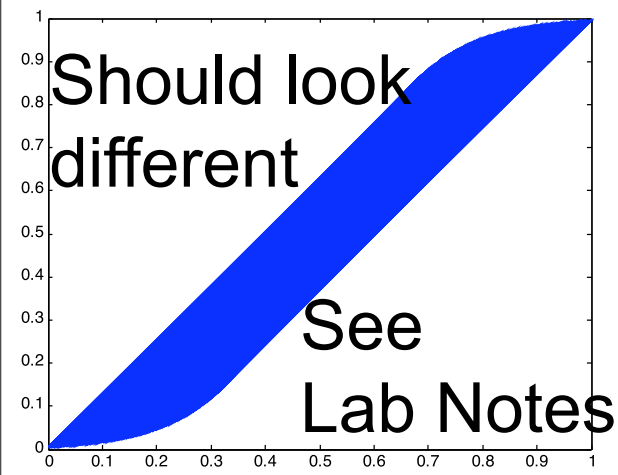

The shape and the range of y-axes is the same for the 4 histograms. The value of m indicates the size of the x-range.

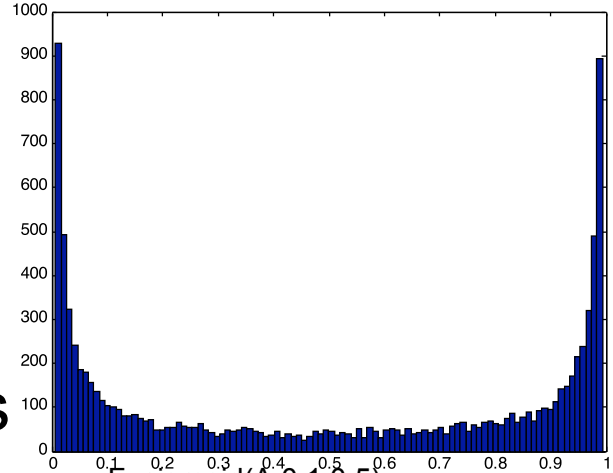
(smaller range for the first histogram)

The value of b sets the center of the histograms.

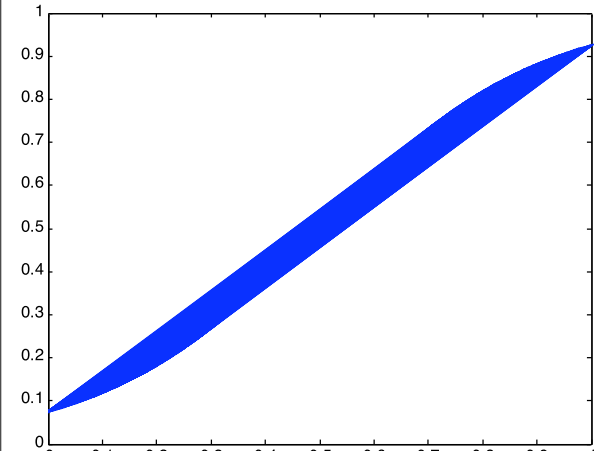
(10 for second histogram, 5 for third histogram)

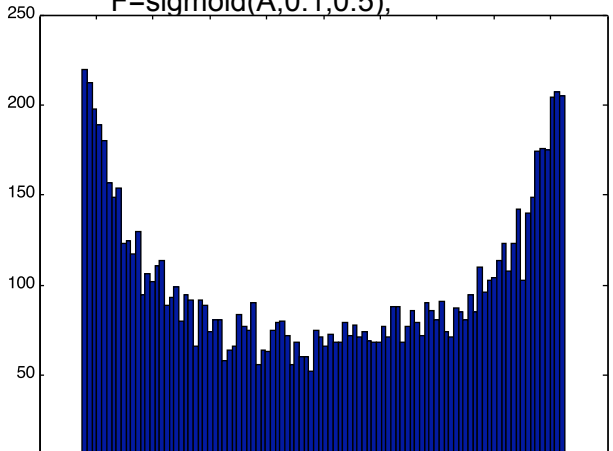
# Problem B.5



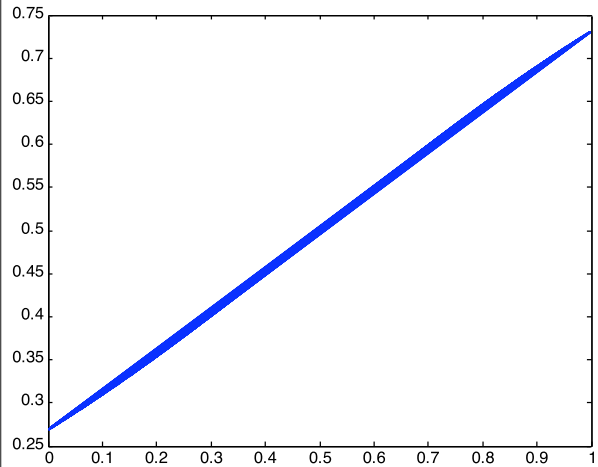



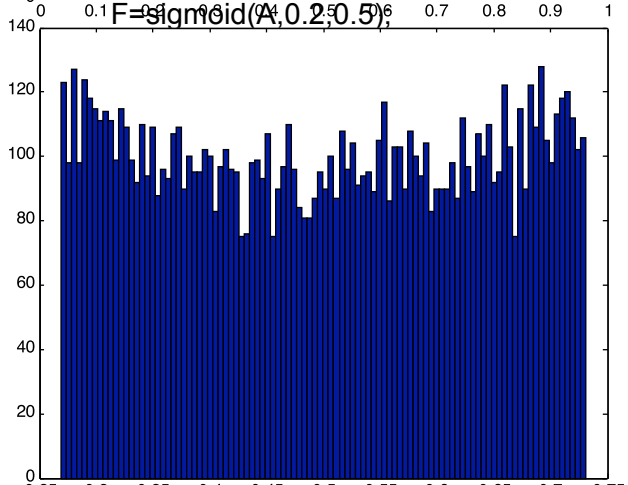
F=sigmoid(A,0.1,0.5);





F=sigmoid(A,0.2,0.5);





F=sigmoid(A,0.5,0.5);

For small k value, in the ‘plot’, the graph gets thicker, and in the ‘histogram’, the gap between the peak and the trough gets larger.

For large k value, in the ‘plot’, the graph gets thinner, and in the ‘histogram’, the gap between the peak and the trough gets smaller.