EE432 Fall 08 Homework Problem Set 5 (PS05) Solutions

1. Generate 1000 samples of uniformly distributed values between -3 and 7. Show the code you used to do this. Use your *stats* function and record the following:

```
x=rand(1000,1)* (7 - -3) - 3;
stats(x)
```

	Expected value	Actual value
Minimum	N/A	-2.994776
Maximum	N/A	6.994916
Mean	$\frac{b+a}{2}=\frac{7-3}{2}=2$	1.888326
Standard Deviation	$\sigma^2=\frac{(b-a)^2}{12}=\frac{(7--3)^2}{12}$ $=8.3333$ $\sigma=2.8868$	2.832419

2. Etter/Ives notes/text, problem 2-6. Note: the find command can be useful in determining values that lie outside a certain range of values.

```
% Problem 2-6, part (a)
n=randn(1000,1)*sqrt(0.5)+2
sd=std(n);
m=mean(n);
% find % values > mean + 1*std
numvals=0;
index=find(n > m+sd);
numvals=numvals+length(index);

% find # values < mean - 1*std:
index=find(n < m-sd);
numvals=numvals+length(index);

% since this is the number outside mean +/- 1 std, subtract from 1000 to
% find the # values within 1 std of mean
numvals=1000-numvals;

fprintf('Percent w/in 1 std is %f\n',numvals/1000 * 100)

% Problem 2-6, part (b)
% find % values > mean + 2*std
numvals=0;
index=find(n > m+2*sd);
numvals=numvals+length(index);

% find # values < mean - 2*std:
```

```
index=find(n < m-2*sd);
numvals=numvals+length(index);

% since this is the number outside mean +/- 2 std, subtract from 1000 to
% find the # values within 1 std of mean
numvals=1000-numvals;

fprintf('Percent w/in 2 std is %f\n',numvals/1000 * 100)

% Problem 2-6, part (c)
% find % values > mean + 3*std
numvals=0;
index=find(n > m+3*sd);
numvals=numvals+length(index);

% find # values < mean - 3*std:
index=find(n < m-3*sd);
numvals=numvals+length(index);

% since this is the number outside mean +/- 1 std, subtract from 1000 to
% find the # values within 1 std of mean
numvals=1000-numvals;

fprintf('Percent w/in 3 std is %f\n',numvals/1000 * 100);

% Problem 2-6, part (d)
fprintf('Percent outside 3 std is %f\n',(1000-numvals)/1000 * 100);
```

Results in the following to be displayed:

```
Percent w/in 1 std is 69.100000
Percent w/in 2 std is 94.700000
Percent w/in 3 std is 99.600000
Percent outside 3 std is 0.400000
```

3. If x = [2 -3 -4 0 17 2], compute $r_{xx}(m)$ by hand. Be sure to show your work. What is the average power of this signal?

See Attached sheet.

(3)

$x = [2 \quad -3 \quad 4 \quad 0 \quad 17 \quad 2]$

$r_{xx}(0)$ $\quad 2 \quad -3 \quad 4 \quad 0 \quad 17 \quad 2$

$4 + 9 + 16 + 289 + 4$ $\qquad r_{xx}(0) = \frac{322}{6} =$

$= \boxed{53.667}$

$r_{xx}(1)$ $\quad 2 \quad -3 \quad 4 \quad 0 \quad 17 \quad 2$

$-3 \quad 4 \quad 0 \quad 17 \quad 2$

$-6 + -12 + 0 + 0 + 34$ $\qquad r_{xx}(1) = \frac{16}{5} = \boxed{3.2}$

$r_{xx}(2)$ $\quad 2 \quad -3 \quad 4 \quad 0 \quad 17 \quad 2$

$4 \quad 0 \quad 17 \quad 2$

$8 + 0 + 68 + 0$ $\qquad r_{xx}(2) = \frac{76}{4} = \boxed{19}$

$r_{xx}(3)$ $\quad 2 \quad -3 \quad 4 \quad 0 \quad 17 \quad 2$

$0 \quad 17 \quad 2$

$0 \quad -51 \quad 8$ $\qquad r_{xx}(3) = \frac{-43}{3} = \boxed{-14.33}$

$r_{xx}(4)$ $\quad 2 \quad -3 \quad 4 \quad 0 \quad 17 \quad 2$

$17 \quad 2$

$34 \quad -6$ $\qquad r_{xx}(4) = \frac{28}{2} = \boxed{14}$

$r_{xx}(5) = \frac{2}{4}$ $\quad 2 \quad -3 \quad 4 \quad 0 \quad 17 \quad 2$ $\qquad r_{xx}(5) = \frac{4}{1} = \boxed{4}$

$r_{xx}(-4) = r_{xx}(4) = 14, \quad r_{xx}(-5) = r_{xx}(5) = 4$

$r_{xx}(-1) = r_{xx}(1) = 3.2. \quad r_{xx}(-2) = r_{xx}(2) = 19 \quad r_{xx}(-3) = r_{xx}(3) = -14.33$