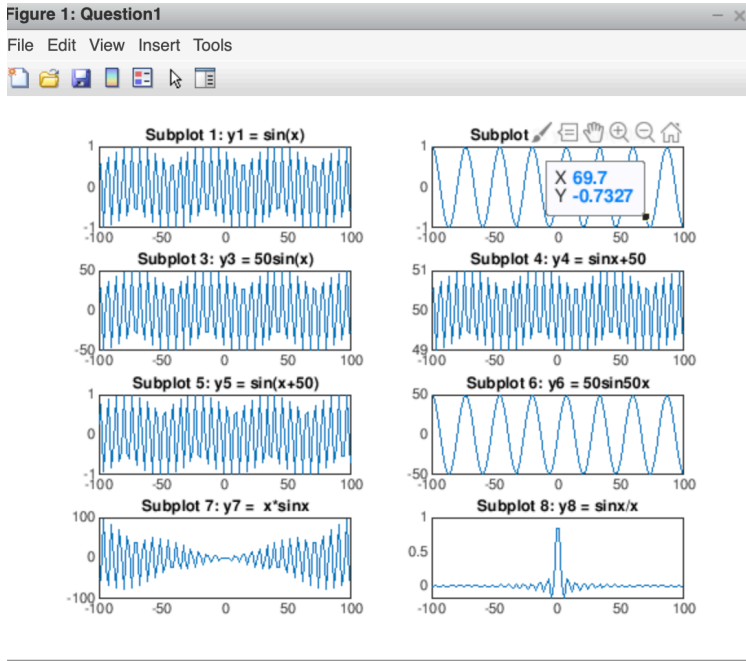


CMPE362: Introduction to Signals for Computer Engineers

Homework-1

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Question 1



In this question, I observed any change in amplitude, frequency or phase affects the plots in closeness of the signal waves or their amplitudes of the signal.

```

1  %----- Problem 1 script -----%
2  figure('Name', 'Question1');
3
4  subplot(4,2,1)
5  x = linspace(-100,100);
6  y1 = sin(x);
7  plot(x, y1)
8  title('Subplot 1: y1 = sin(x)')
9
10 subplot(4,2,2)
11 y2 = sin(50*x);
12 plot(x, y2)
13 title('Subplot 2: y2 = sin(50x)')
14
15 subplot(4,2,3)
16 y3 = 50*sin(x);
17 plot(x, y3)
18 title('Subplot 3: y3 = 50sin(x)')
19
20 subplot(4,2,4)
21 y4 = sin(x) + 50;
22 plot(x, y4)
23 title('Subplot 4: y4 = sinx+50')
24

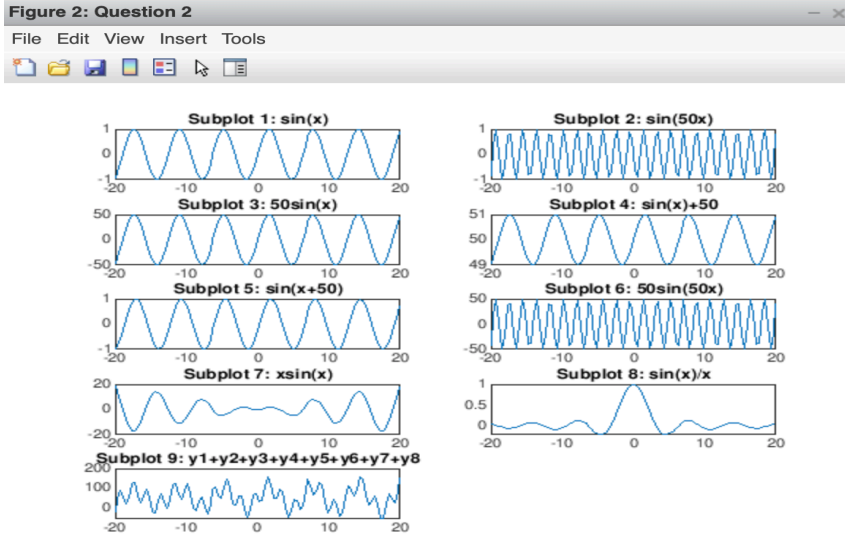
```

```

25 subplot(4,2,5)
26 y5 = sin(x + 50);
27 plot(x, y5)
28 title('Subplot 5: y5 = sin(x+50)')
29
30 subplot(4,2,6)
31 y6 = 50*sin(50*x);
32 plot(x, y6)
33 title('Subplot 6: y6 = 50sin50x')
34
35 subplot(4,2,7)
36 y7 = x.*sin(x);
37 plot(x, y7)
38 title('Subplot 7: y7 = x*sinx')
39
40 subplot(4,2,8)
41 y8 = sin(x)./x;
42 plot(x, y8)
43 title('Subplot 8: y8 = sinx/x')
44

```

Question 2



In this question, I had a chance to observe different sin waves like question 1, but line spaces are smaller than question 1, so it was a better observation.

```

45 %----- Problem 2 script -----%
46
47 figure('Name', 'Question 2');
48 x = linspace(-20,20); %x is
49
50 subplot(5,2,1)
51 y1 = sin(x);
52 plot(x,y1)
53 title('Subplot 1: sin(x)')
54
55 subplot(5,2,2)
56 y2 = sin(50*x);
57 plot(x,y2)
58 title('Subplot 2: sin(50x)')
59
60 subplot(5,2,3)
61 y3 = 50*sin(x);
62 plot(x,y3)
63 title('Subplot 3: 50sin(x)')
64
65 subplot(5,2,4)
66 y4 = sin(x)+50;
67 plot(x,y4)
68 title('Subplot 4: sin(x)+50')
69

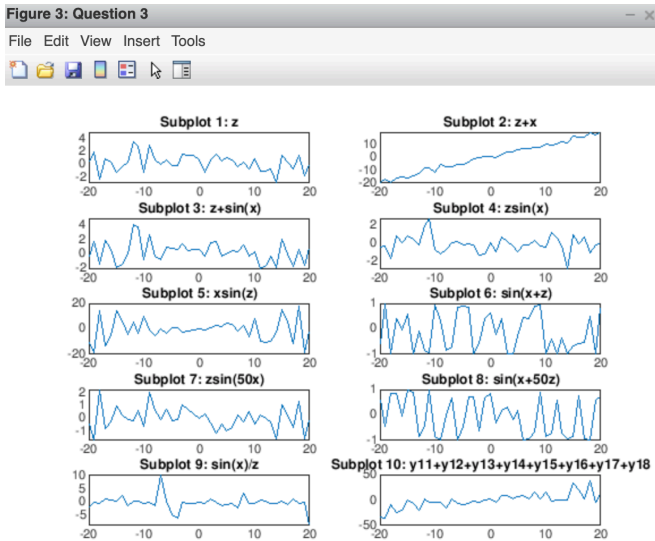
```

```

69
70 subplot(5,2,5)
71 y5 = sin(x+50);
72 plot(x,y5)
73 title('Subplot 5: sin(x+50)')
74
75 subplot(5,2,6)
76 y6 = 50*sin(50*x);
77 plot(x,y6)
78 title('Subplot 6: 50sin(50x)')
79
80 subplot(5,2,7)
81 y7 = x.*sin(x);
82 plot(x,y7)
83 title('Subplot 7: xsin(x)')
84
85 subplot(5,2,8)
86 y8 = sin(x)./x;
87 plot(x,y8)
88 title('Subplot 8: sin(x)/x')
89
90 subplot(5,2,9)
91 y9 = y1+y2+y3+y4+y5+y6+y7+y8;
92 plot(x,y9)
93 title('Subplot 9: y1+y2+y3+y4+y5+y6+y7+y8')
94
95 %----- Problem 3 script -----%

```

Question 3



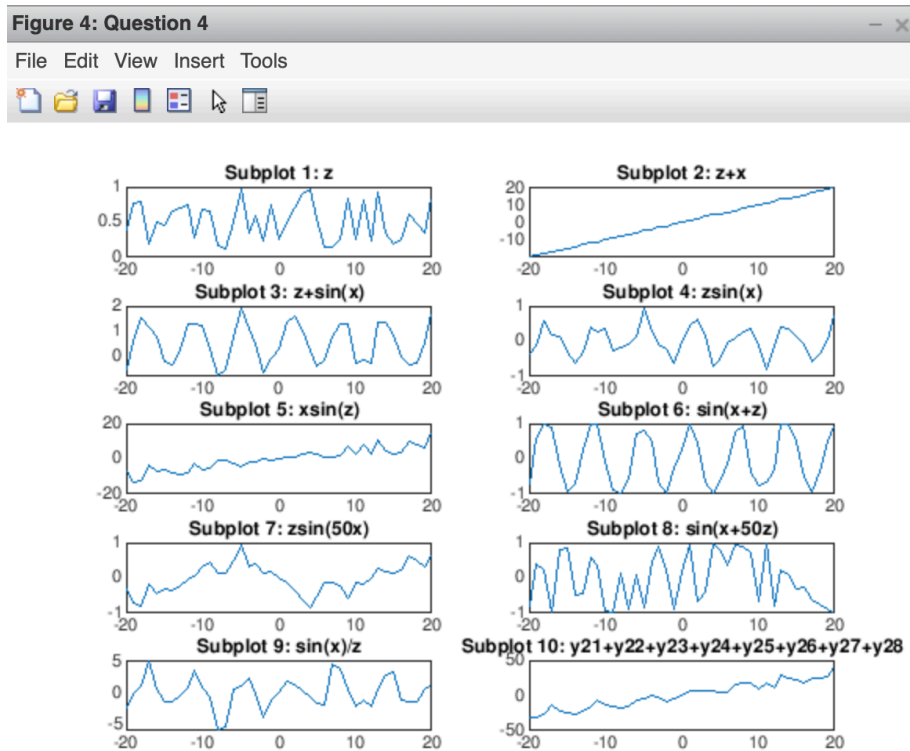
In this question, z makes noise for other signals and we can see that signal plots are sum of sinusoids.

```

95  %----- Problem 3 script -----%
96
97  figure('Name', 'Question 3');
98
99  x = (-20:20);
100  z = randn(1,41);           %z is a vector
101
102  subplot(5,2,1)
103  y10 = z;
104  plot(x,y10)
105  title('Subplot 1: z')
106
107  subplot(5,2,2)
108  y11 = z+x;
109  plot(x,y11)
110  title('Subplot 2: z+x')
111
112  subplot(5,2,3)
113  y12 = z+sin(x);
114  plot(x,y12)
115  title('Subplot 3: z+sin(x)')
116
117  subplot(5,2,4)
118  y13 = z.*sin(x);
119  plot(x,y13)
120  title('Subplot 4: zsin(x)')
121
122  subplot(5,2,5)
123  y14 = x.*sin(z);
124  plot(x,y14)
125  title('Subplot 5: xsin(z)')
126
127  subplot(5,2,6)
128  y15 = sin(x+z);
129  plot(x,y15)
130  title('Subplot 6: sin(x+z)')
131
132  subplot(5,2,7)
133  y16 = z.*sin(50*x);
134  plot(x,y16)
135  title('Subplot 7: zsin(50x)')
136
137  subplot(5,2,8)
138  y17 = sin(x+50*z);
139  plot(x,y17)
140  title('Subplot 8: sin(x+50z)')
141
142  subplot(5,2,9)
143  y18 = sin(x)./z;
144  plot(x,y18)
145  title('Subplot 9: sin(x)/z')
146
147  subplot(5,2,10)
148  y19 = y11+y12+y13+y14+y15+y16+y17+y18;
149  plot(x,y19)
150  title('Subplot 10: y11+y12+y13+y14+y15+y16+y17+y18')
151
152

```

Question 4

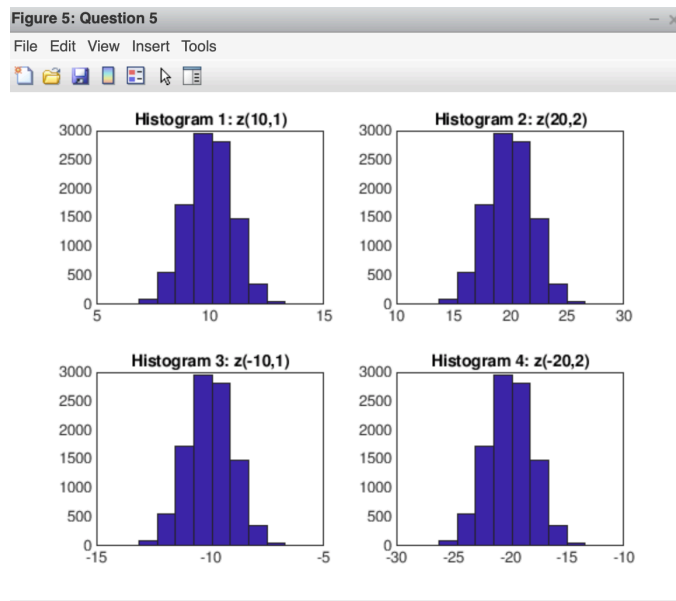


```

153 %----- Problem 4 script -----%
154 figure('Name', 'Question 4');
155
156 x = (-20:20);
157 z = rand(1,41);
158
159 subplot(5,2,1)
160 y20 = z;
161 plot(x,y20)
162 title('Subplot 1: z')
163
164 subplot(5,2,2)
165 y21 = z+x;
166 plot(x,y21)
167 title('Subplot 2: z+x')
168
169 subplot(5,2,3)
170 y22 = z+sin(x);
171 plot(x,y22)
172 title('Subplot 3: z+sin(x)')
173
174 subplot(5,2,4)
175 y23 = z.*sin(x);
176 plot(x,y23)
177 title('Subplot 4: zsin(x)')
178
179 subplot(5,2,5)
180 y24 = x.*sin(z);
181 plot(x,y24)
182 title('Subplot 5: xsin(z)')
183
184 subplot(5,2,6)
185 y25 = sin(x+z);
186 plot(x,y25)
187 title('Subplot 6: sin(x+z)')
188
189 subplot(5,2,7)
190 y26 = z.*sin(50*x);
191 plot(x,y26)
192 title('Subplot 7: zsin(50x)')
193
194 subplot(5,2,8)
195 y27 = sin(x+50*z);
196 plot(x,y27)
197 title('Subplot 8: sin(x+50z)')
198
199 subplot(5,2,9)
200 y28 = sin(x)./z;
201 plot(x,y28)
202 title('Subplot 9: sin(x)/z')
203
204 subplot(5,2,10)
205 y29 = y21+y22+y23+y24+y25+y26+y27+y28;
206 plot(x,y29)
207 title('Subplot 10: y21+y22+y23+y24+y25+y26+y27+y28')
208

```

Question 5



```

209 %----- Problem 5 script -----%
210 figure('Name', 'Question 5');
211
212 z = randn(10000,1);
213
214 mean1 = 0;
215
216 mu1 = 1;
217 std1 = sqrt(mu1);
218 r1 = mean1 + z*std1;
219 subplot(2,2,1)
220 hist(r1)
221 title('Histogram 1: z(0,1)')
222
223 mu2 = 4;
224 std2 = sqrt(mu2);
225 r2 = mean1 + z*std2; %Generate 10000
226 subplot(2,2,2)
227 hist(r2)
228 title('Histogram 2: z(0,2)')
229

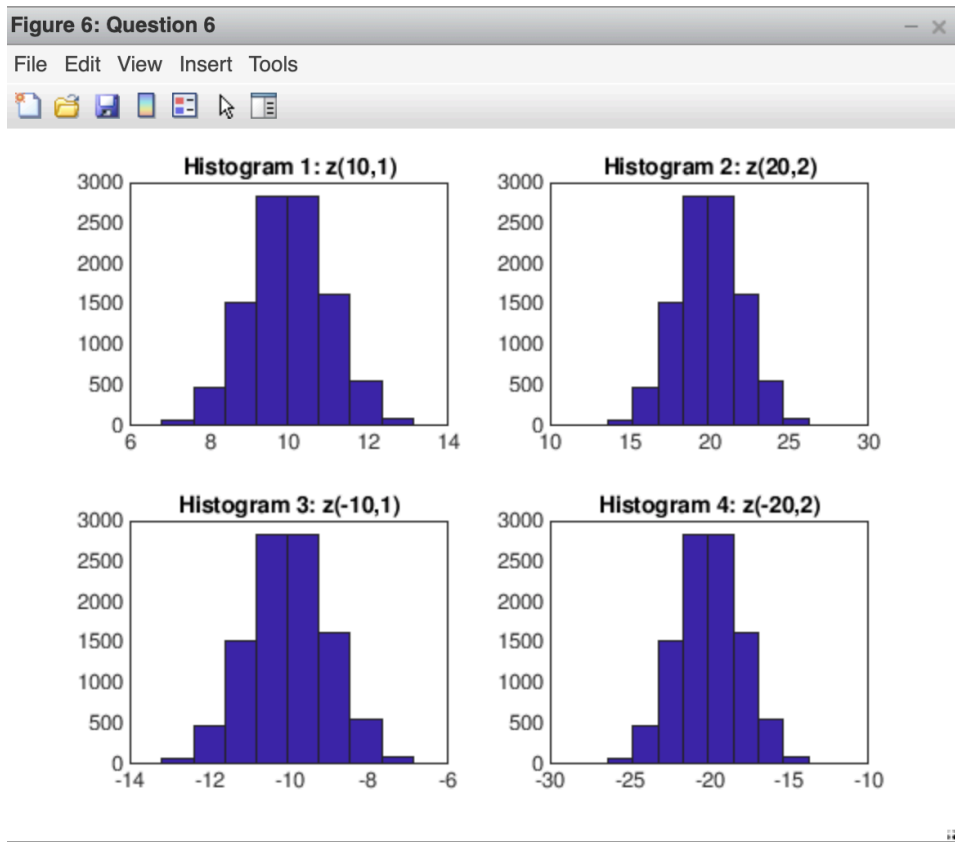
```

```

229
230 mu3 = 16;
231 std3 = sqrt(mu3);
232 r3 = mean1 + z*std3; %Generate 10000 ra
233 subplot(2,2,3)
234 hist(r3)
235 title('Histogram 3: z(0,4)')
236
237 mu4 = 256;
238 std4 = sqrt(mu4);
239 r4 = mean1 + z*std4; %Generate 10000 ran
240 subplot(2,2,4)
241 hist(r4)
242 title('Histogram 4: z(0,16)')
243

```

Question 6



```
%----- Problem 6 script -----%
figure('Name', 'Question 6');
z = randn(10000,1);

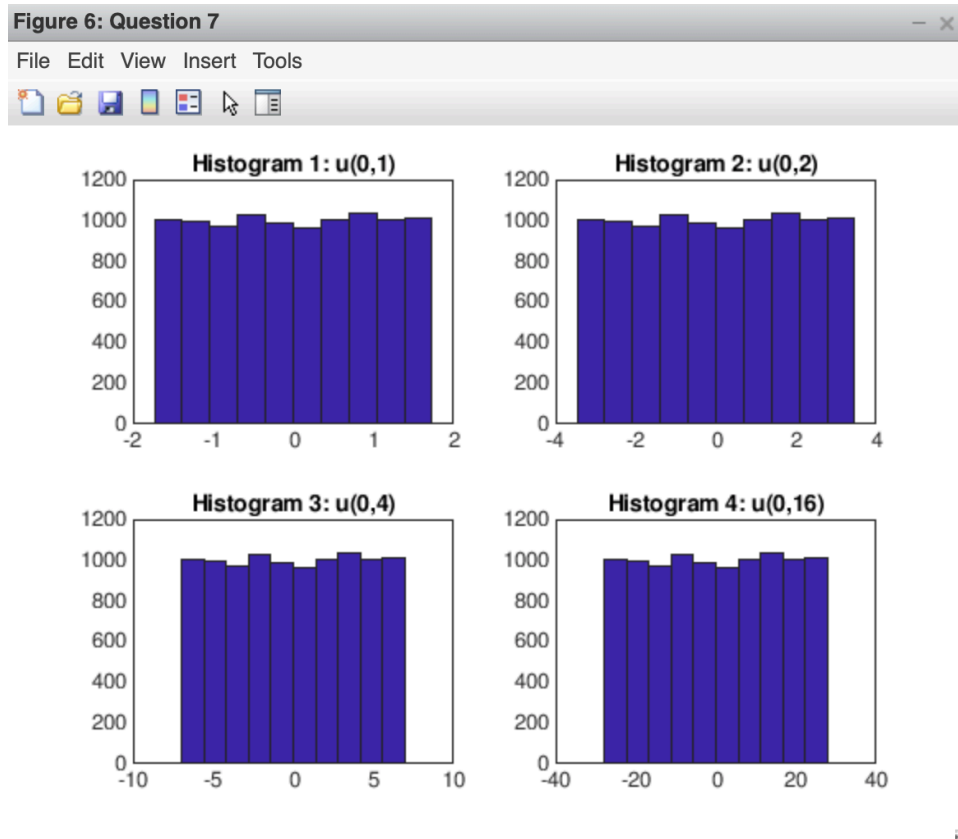
mean1 = 10;
mu1 = 1;
std1 = sqrt(mu1);
r6 = mean1 + z*std1;
subplot(2,2,1)
hist(r6)
title('Histogram 1: z(10,1)')

mean2 = 20;
mu2 = 4;
std2 = sqrt(mu2);
r7 = mean2 + z*std2;    %Generate 10000 r
subplot(2,2,2)
hist(r7)
title('Histogram 2: z(20,2)')
```

```
mean3 = -10;
mu3 = 1;
std3 = sqrt(mu3);
r8 = mean3 + z*std3;    %Generate 10000 rando
subplot(2,2,3)
hist(r8)
title('Histogram 3: z(-10,1)')

mean4 = -20;
mu4 = 4;
std4 = sqrt(mu4);
r9 = mean4 + z*std4;    %Generate 10000 random
subplot(2,2,4)
hist(r9)
title('Histogram 4: z(-20,2)')
```

Question 7

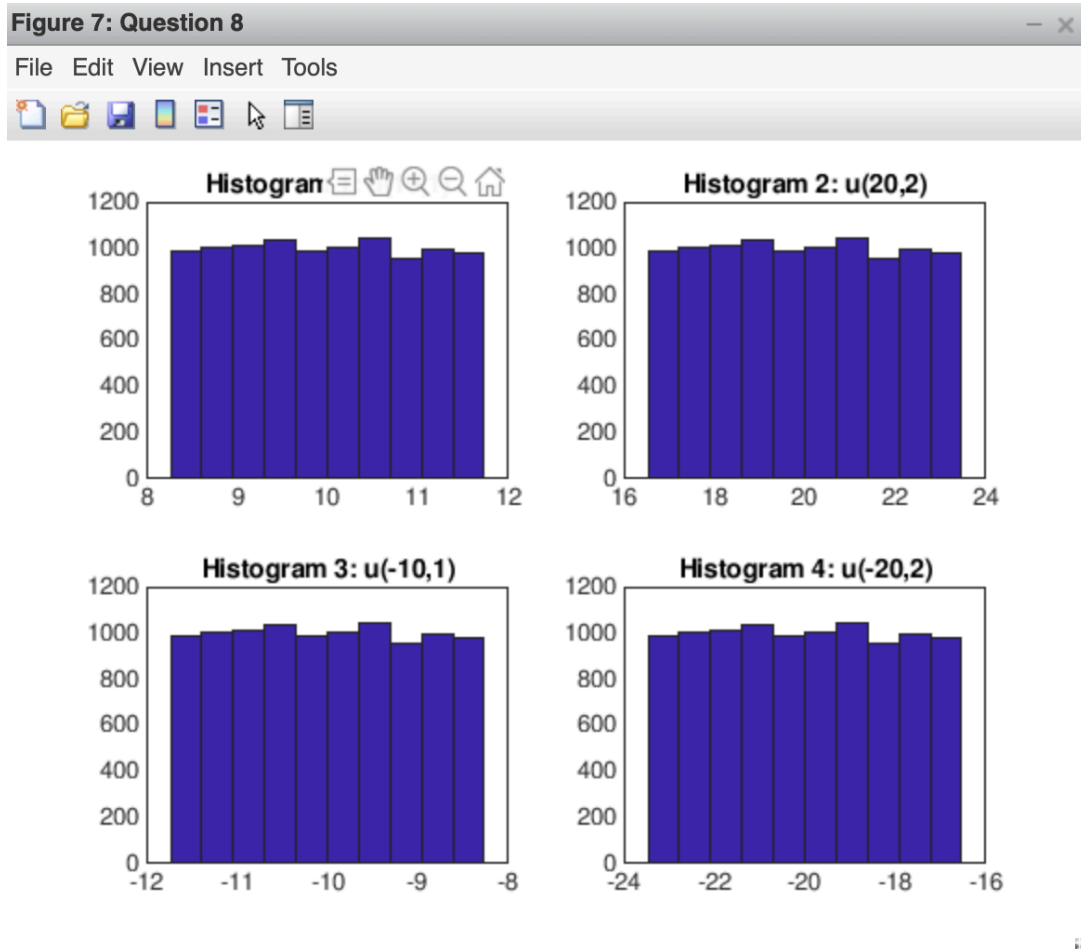


```

280
281 %----- Problem 7 script -----%
282
283 figure('Name', 'Question 7');
284
285 z = rand(10000,1);
286
287 mean = 0;
288
289 var1 = 1;
290 a = sqrt(3*var1) + mean;
291 b = mean - sqrt(3*var1);
292
293 r11 = a + (b-a)*z; %Generate 10000 random variables
294 subplot(2,2,1)
295 hist(r11)
296 title('Histogram 1: u(0,1)')
297
298 var2 = 4;
299 a2 = sqrt(3*var2) + mean;
300 b2 = mean - sqrt(3*var2);
301
302 r21 = a2 + (b2-a2)*z; %Generate 10000 random variables
303 subplot(2,2,2)
304 hist(r21)
305 title('Histogram 2: u(0,2)')
306
307 var3 = 16;
308 a3 = sqrt(3*var3) + mean;
309 b3 = mean - sqrt(3*var3);
310
311 r31 = a3 + (b3-a3)*z; %Generate 10000 random variables
312 subplot(2,2,3)
313 hist(r31)
314 title('Histogram 3: u(0,4)')
315
316 var4 = 256;
317 a4 = sqrt(3*var4) + mean;
318 b4 = mean - sqrt(3*var4);
319
320 r41 = a4 + (b4-a4)*z; %Generate 10000 random variables
321 subplot(2,2,4)
322 hist(r41)
323 title('Histogram 4: u(0,16)')

```


Question 8



```

325 %----- Problem 8 script -----%
326
327 figure('Name', 'Question 8');
328
329 z = rand(10000,1);
330
331 mean1 = 10;
332 var1 = 1;
333 a1 = sqrt(3*var1) + mean1;
334 b1 = mean1 - sqrt(3*var1); %Generate 100
335 r61 = a1 + (b1-a1)*z;
336 subplot(2,2,1)
337 hist(r61)
338 title('Histogram 1: u(10,1)')
339
340 mean2 = 20;
341 var2 = 4;
342 a2 = sqrt(3*var2) + mean2;
343 b2 = mean2 - sqrt(3*var2);
344 r71 = a2 + (b2-a2)*z; %Generate 10000 ra
345 subplot(2,2,2)
346 hist(r71)
347 title('Histogram 2: u(20,2)')
348

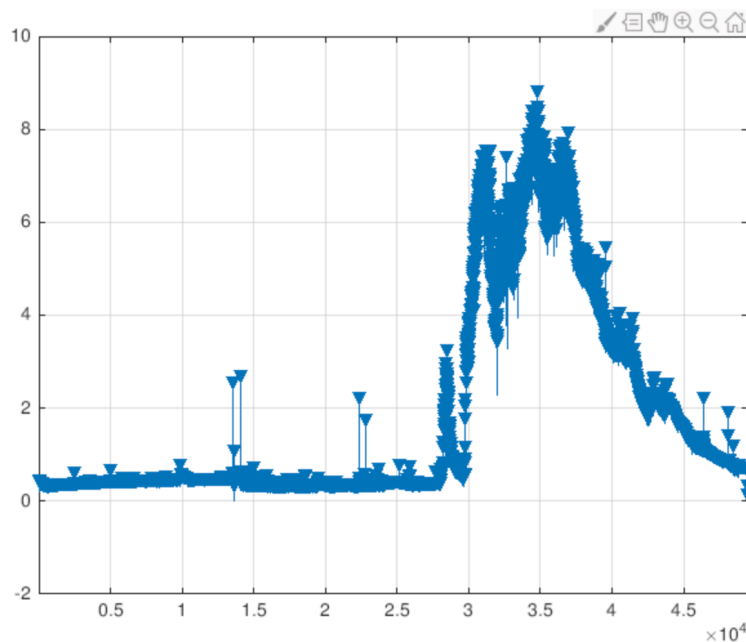
```

```

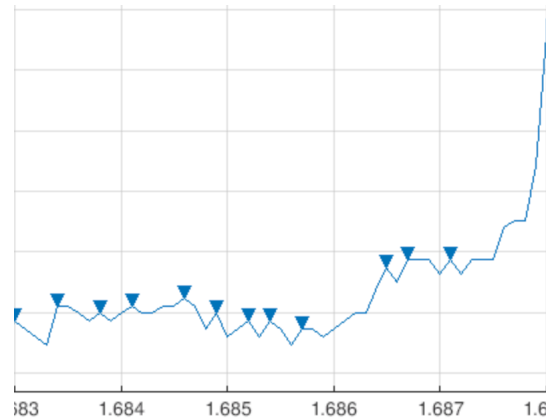
348
349 mean3 = -10;
350 var3 = 1;
351 a3 = sqrt(3*var3) + mean3;
352 b3 = mean3 - sqrt(3*var3);
353 r81 = a3 + (b3-a3)*z; %Generate :
354 subplot(2,2,3)
355 hist(r81)
356 title('Histogram 3: u(-10,1)')
357
358 mean4 = -20;
359 var4 = 4;
360 a4 = sqrt(3*var4) + mean4;
361 b4 = mean4 - sqrt(3*var4);
362 r91 = a4 + (b4-a4)*z; %Generate :
363 subplot(2,2,4)
364 hist(r91)
365 title('Histogram 4: u(-20,2)')
366

```

Question 9



```
data = dlmread('exampleSignal.csv',' ','A4..A49502');
plot(data);
findpeaks(data);
```



In this question, I observed that findpeaks method cannot show the peak if the peak is the second of a flat peak.

Question 10

```
RGB = imread('lena.png');
gray = rgb2gray(RGB);
M = mean2(gray);
STD = std2(gray);
maximum = max(max(gray))
[x,y]=find(gray==maximum)
minimum = min(min(gray))
[x2,y2]=find(gray==minimum)
[min,loc] = min(gray(:))
```

NAME ▲	VALUE	SIZE	CLASS
gray	512x512 uint8	512x512	uint8
M	124.0425	1x1	double
max_x	274	1x1	double
max_y	396	1x1	double
maximum	245	1x1	uint8
min_x	72	1x1	double
min_y	4	1x1	double
minimum	25	1x1	uint8
RGB	512x512x3 uint8	512x512x3	uint8
STD	47.8556	1x1	double

First opinion about Matlab & Challenges

First of all, matlab is a big program and my computer frozed a lot while matlab is running and I had to work on the project in online platform. However plotting signals and calculating mean, standard deviation kind of things with big data is very simple compared to other programming languages or excel.