```
%%Q4(A)
clear all;
close all;
w= 2*pi/3
```

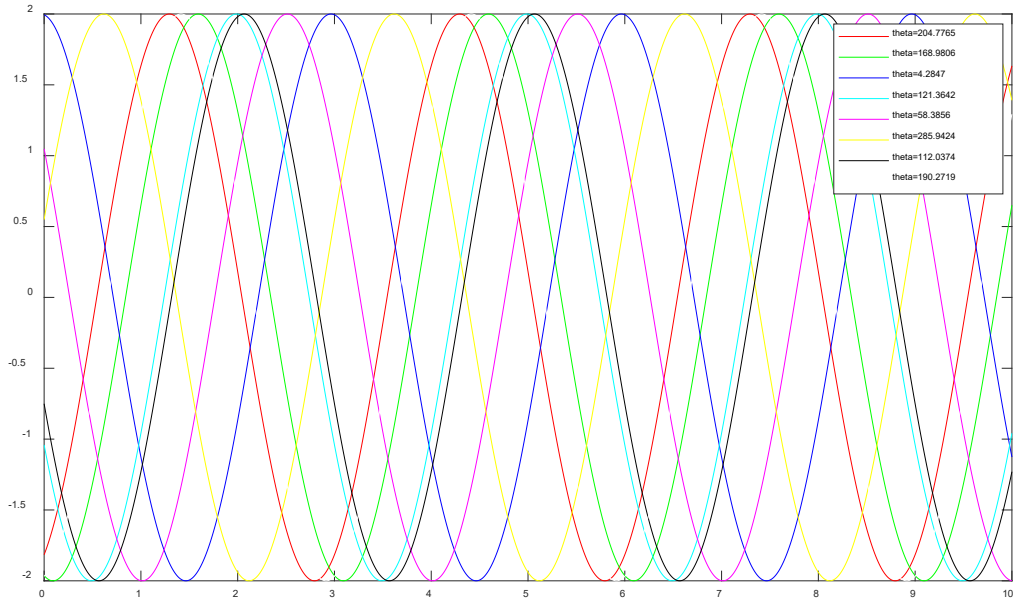
```
w = 2.0944
```

```
t=0:0.01:10;

lower_limit = 0;
upper_limit = 2*pi;

realztn_theta = lower_limit + (upper_limit-lower_limit)*rand([1 8]);

x1= 2*cos(w*t+realztn_theta(1));
plot(t,x1,'r','DisplayName',strcat('theta=', num2str(realztn_theta(1)*180/pi))
)
hold on;
x2= 2*cos(w*t+realztn_theta(2));
plot(t,x2,'g','DisplayName',strcat('theta=', num2str(realztn_theta(2)*180/pi)))
x3= 2*cos(w*t+realztn_theta(3));
plot(t,x3,'b','DisplayName',strcat('theta=', num2str(realztn_theta(3)*180/pi)))
x4= 2*cos(w*t+realztn_theta(4));
plot(t,x4,'c','DisplayName',strcat('theta=', num2str(realztn_theta(4)*180/pi)))
x5= 2*cos(w*t+realztn_theta(5));
plot(t,x5,'m','DisplayName',strcat('theta=', num2str(realztn_theta(5)*180/pi)))
x6= 2*cos(w*t+realztn_theta(6));
plot(t,x6,'y','DisplayName',strcat('theta=', num2str(realztn_theta(6)*180/pi)))
x7= 2*cos(w*t+realztn_theta(7));
plot(t,x7,'k','DisplayName',strcat('theta=', num2str(realztn_theta(7)*180/pi)))
x8= 2*cos(w*t+realztn_theta(8));
plot(t,x8,'w','DisplayName',strcat('theta=', num2str(realztn_theta(8)*180/pi)))
legend('show')
```




```
%%Q4(b)(i-ii) t1=0.8
close all;
t_1=0.8;

realztn_theta = lower_limit + (upper_limit-lower_limit)*rand([1 10e3]);
xout=zeros(1,10e3);

for i = 1: 10000
    xout(i)= 2*cos(w* t_1 + realztn_theta(i));
end

h = histogram(xout,100)
```

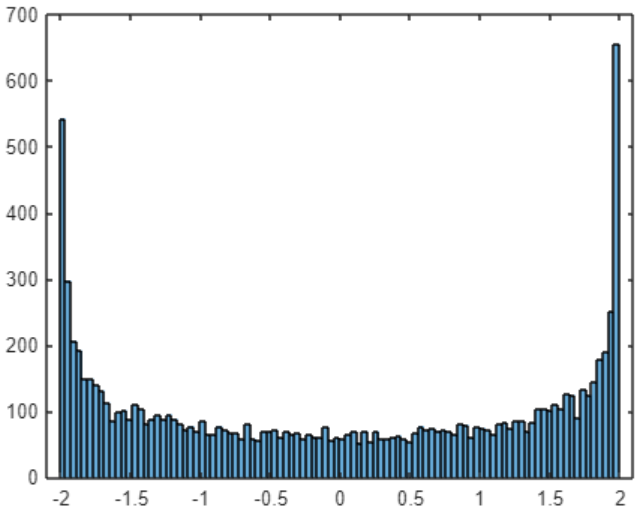
```
h =
  Histogram with properties:

            Data: [-1.6830 -0.6686 -1.9995 1.1174 -1.4233 0.7959 -1.3431 -1.5630 -1.9522
1.8122 2.0000 -0.1321 -0.4589 1.9678 -0.7856 0.4844 -0.7816 -1.9979 -1.9606 -1.9968 -1.9274
0.3043 -0.1399 0.5324 1.9998 1.8471 -1.7075 1.6736 1.9889 -0.0803 … ]
          Values: [543 298 207 192 150 150 140 132 113 86 99 102 88 110 104 82 89 95 88 96
89 82 73 78 69 86 65 66 78 72 67 67 59 81 59 56 69 69 72 60 69 65 67 58 65 62 61 77 56 60 58
65 70 53 70 54 70 58 59 61 64 58 54 68 78 73 75 71 72 69 66 81 80 … ]
         NumBins: 100
        BinEdges: [-2.0100 -1.9699 -1.9298 -1.8897 -1.8496 -1.8095 -1.7694 -1.7293 -1.6892
-1.6491 -1.6090 -1.5689 -1.5288 -1.4887 -1.4486 -1.4085 -1.3684 -1.3283 -1.2882 -1.2481 -
1.2080 -1.1679 -1.1278 -1.0877 -1.0476 -1.0075 -0.9674 -0.9273 … ]
         BinWidth: 0.0401
        BinLimits: [-2.0100 2.0000]
    Normalization: 'count'
        FaceColor: 'auto'
```

```
        EdgeColor: [0 0 0]

  Show all properties
```

```
xlim([-2.1, 2.1]);
```




```
%%Q4(b)(i-ii) t2=1.25
close all;
t_2=1.25;

realztn_theta = lower_limit + (upper_limit-lower_limit)*rand([1 10e3]);
xout=zeros(1,10e3);
for i = 1: 10000
    xout(i)= 2*cos(w* t_2 + realztn_theta(i));
end

h = histogram(xout,100)
```

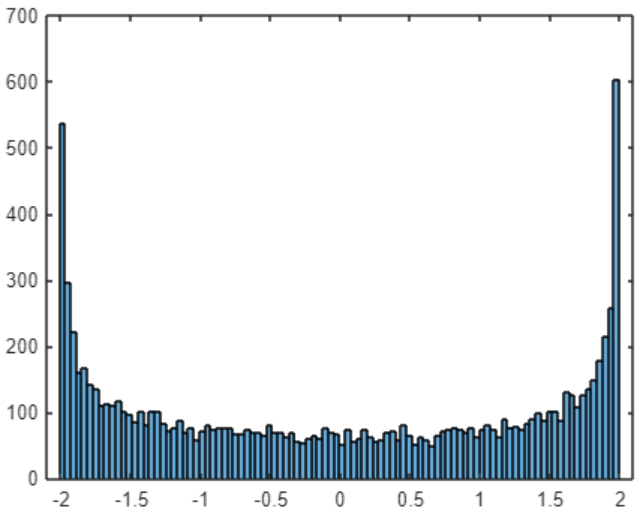
```
h =
  Histogram with properties:

            Data: [-0.3932 1.3477 -0.4005 1.6759 1.9912 1.8390 -1.0729 -0.7390 -0.1076
0.0680 0.1428 1.9944 -1.5332 -0.4094 -1.0732 -1.6394 -1.6732 -0.9838 -1.1398 0.1609 1.9851 -
1.9766 -0.3871 -0.2415 -1.9994 1.7046 0.8184 -0.2307 0.6927 -1.3173 … ]
          Values: [537 296 223 160 167 142 135 110 114 110 117 102 98 86 101 81 103 101 83
73 78 89 69 78 59 73 81 75 76 76 76 67 68 74 70 69 66 82 70 70 63 69 57 55 60 65 62 76 70 68
51 74 56 60 74 63 56 58 71 72 59 81 65 53 64 59 49 66 73 74 78 75 … ]
         NumBins: 100
        BinEdges: [-2.0100 -1.9699 -1.9298 -1.8897 -1.8496 -1.8095 -1.7694 -1.7293 -1.6892
-1.6491 -1.6090 -1.5689 -1.5288 -1.4887 -1.4486 -1.4085 -1.3684 -1.3283 -1.2882 -1.2481 -
1.2080 -1.1679 -1.1278 -1.0877 -1.0476 -1.0075 -0.9674 -0.9273 … ]
        BinWidth: 0.0401
       BinLimits: [-2.0100 2.0000]
```

```
    Normalization: 'count'
        FaceColor: 'auto'
        EdgeColor: [0 0 0]

  Show all properties
```

```
xlim([-2.1, 2.1]);
```




```
%%Q4(b)(i-ii) t3=1.45
close all;
t_3=1.45;

realztn_theta = lower_limit + (upper_limit-lower_limit)*rand([1 10e3]);
xout=zeros(1,10e3);
for i = 1: 10000
    xout(i)= 2*cos(w* t_3 + realztn_theta(i));
end

h = histogram(xout,100)
```

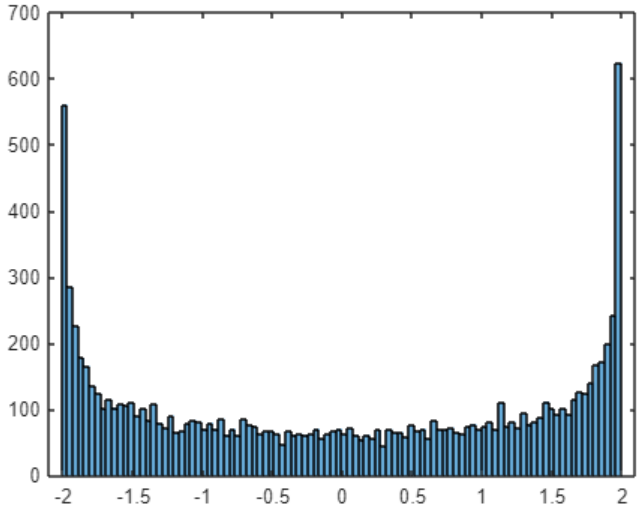
```
h =
  Histogram with properties:

            Data: [-1.1829 -1.3576 0.0410 1.8135 -1.6937 1.9860 1.9964 -1.9812 -0.3715
1.7149 1.9057 -0.6479 0.6735 -1.2319 -1.4918 -1.9999 -0.1562 -0.7671 -0.4237 -0.1759 -0.6319
-1.9031 1.9979 -0.8991 -1.6745 -1.9992 1.2011 0.7123 -0.4605 -1.4417 … ]
          Values: [561 286 226 178 166 136 125 102 115 103 109 106 110 90 101 83 109 80 72
91 66 67 79 84 82 71 80 71 86 62 71 60 85 76 74 64 67 67 64 48 67 62 63 62 64 71 56 63 67 71
63 73 62 55 62 56 69 45 70 66 66 58 76 68 71 56 83 69 70 73 66 63 … ]
         NumBins: 100
        BinEdges: [-2.0100 -1.9699 -1.9298 -1.8897 -1.8496 -1.8095 -1.7694 -1.7293 -1.6892
-1.6491 -1.6090 -1.5689 -1.5288 -1.4887 -1.4486 -1.4085 -1.3684 -1.3283 -1.2882 -1.2481 -
1.2080 -1.1679 -1.1278 -1.0877 -1.0476 -1.0075 -0.9674 -0.9273 … ]
```

```
         BinWidth: 0.0401
        BinLimits: [-2.0100 2.0000]
    Normalization: 'count'
        FaceColor: 'auto'
        EdgeColor: [0 0 0]

  Show all properties
```

```
xlim([-2.1, 2.1]);
```




```
%%Q4(b)(i-ii) t4=2.87
close all;
t_4=2.87;

realztn_theta = lower_limit + (upper_limit-lower_limit)*rand([1 10e3]);
xout=zeros(1,10e3);

for i = 1: 10000
    xout(i)= 2*cos(w* t_4 + realztn_theta(i));
end

h = histogram(xout,100)
```

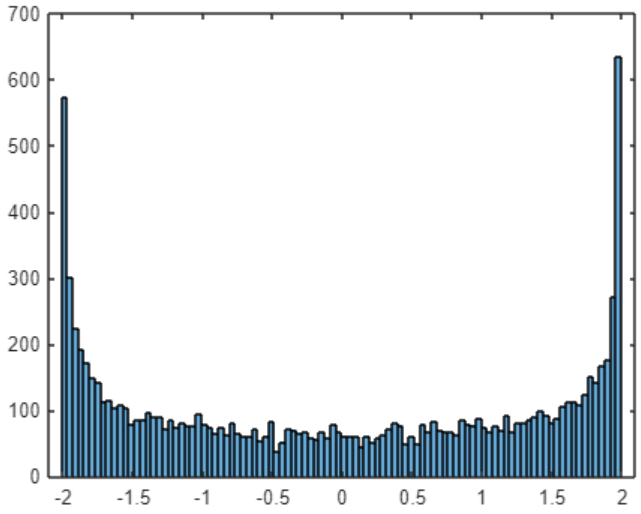
```
h =
  Histogram with properties:

            Data: [1.7713 -0.0425 1.6082 0.8315 1.2931 0.0565 1.1815 -0.4325 -1.5395 -
1.1678 0.7548 -1.8434 1.3113 -1.9873 -1.5632 -1.9861 -1.5796 0.4720 -1.0576 -0.9320 1.9986 -
1.4969 -0.8582 1.1587 -0.7860 1.8693 0.2809 1.9700 1.8480 -1.8785 … ]
          Values: [574 301 225 192 173 150 142 114 116 104 108 104 80 86 87 98 90 90 72 85
75 82 77 76 95 79 75 66 75 64 81 65 60 60 72 54 62 83 39 53 73 71 66 67 59 56 68 59 79 67 62
61 60 46 62 52 58 63 73 81 78 50 60 50 80 67 84 69 68 67 63 86 80 … ]
```

```
          NumBins: 100
         BinEdges: [-2.0100 -1.9699 -1.9298 -1.8897 -1.8496 -1.8095 -1.7694 -1.7293 -1.6892
-1.6491 -1.6090 -1.5689 -1.5288 -1.4887 -1.4486 -1.4085 -1.3684 -1.3283 -1.2882 -1.2481 -
1.2080 -1.1679 -1.1278 -1.0877 -1.0476 -1.0075 -0.9674 -0.9273 … ]
          BinWidth: 0.0401
         BinLimits: [-2.0100 2.0000]
     Normalization: 'count'
         FaceColor: 'auto'
         EdgeColor: [0 0 0]

  Show all properties
```

```
xlim([-2.1, 2.1]);
```



Yes, I observed the stationarity in the first order since all the histogram results are almost the same.