DSP2 Week 3 experiment Report

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EXERCISE 1

(Source Code)

```matlab
1   v = (0:1:500) * pi/500 % axis divided into 501 points
2   X = exp(j*v) ./ (exp(j*v) - 0.5)

3   subplot(2,2,1);
4   plot(v, abs(X));
5   title('Magnitude Part');
6   xlabel('Angular Frequency (w)');
7   ylabel('Magnitude');

8   subplot(2,2,2)
9   plot(v, angle(X))
10  title('Angle Part');
11  xlabel('Angular Frequency (w)');
12  ylabel('Radians');

13  subplot(2,2,3)
14  plot(v, real(X))
15  title('Real Part');
16  xlabel('Angular Frequency (w)');
17  ylabel('Real');

18  subplot(2,2,4)
19  plot(v, imag(X))
20  title('Imaginary Part');
21  xlabel('Angular Frequency (w)');
22  ylabel('Imaginary');
```
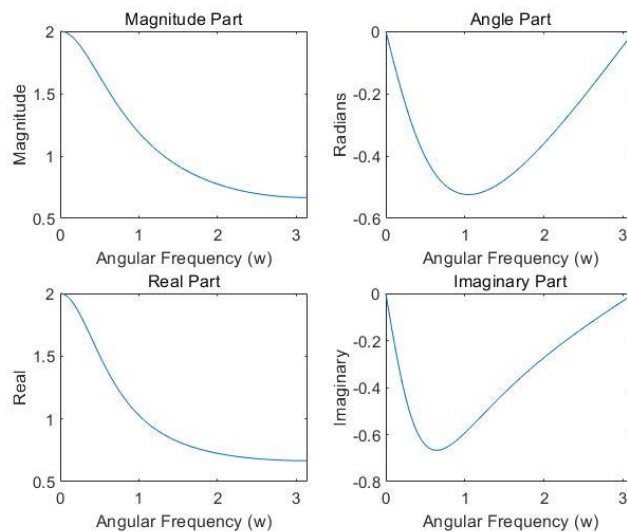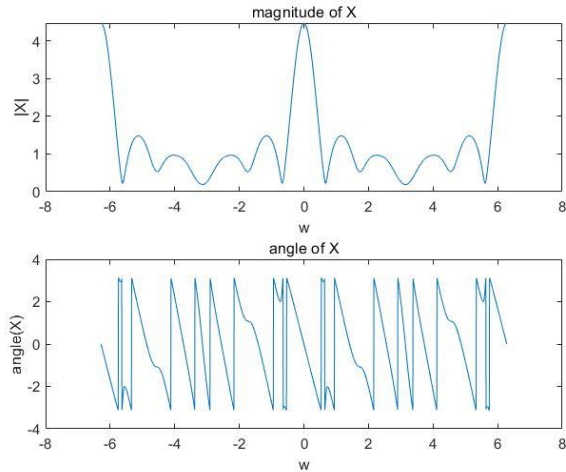
(Result)

EXERCISE 2

a)

(Source Code)

```
1   n = 0:10;
2   x = rand(1, 11);
3   k = -1000:1000;
4   w = (pi/500)*k;
5   X = x * (exp(-j*pi/500)) .^ (n'*k);
6   magX = abs(X);
7   angX = angle(X);
8
9   subplot(2,1,1)
10  plot(w, magX)
11  title('magnitude of X')
12  xlabel('w')
13  ylabel('|X|')
14
15  subplot(2,1,2)
16  plot(w, angX)
17  title('angle of X')
18  xlabel('w')
19  ylabel('angle(X)')
```
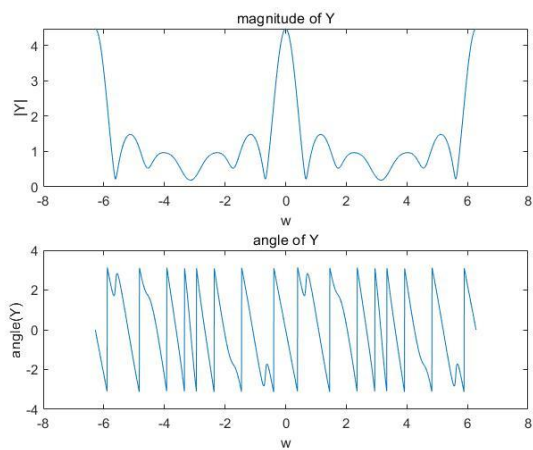
(Result)

b)

(Source Code)

```
20      y = x;
21      m = n + 2;
22      Y = y * (exp(-j*pi/500)) .^ (m'*k);
23      magY = abs(Y);
24      angY = angle(Y);
25
26      subplot(2,1,1)
27      plot(w, magY)
28      title('magnitude of Y')
29      xlabel('w')
30      ylabel('|Y|')
31
32      subplot(2,1,2)
33      plot(w, angY)
34      title('angle of Y')
35      xlabel('w')
36      ylabel('angle(Y)')
```

(Result)

c)

(Source Code)

```
37      Ycheck = X .*exp(-j*pi/500).^(2*k)
38      difference = abs(Y - Ycheck)
39      max(abs(Y - Ycheck))
```

(Result)

```
Ycheck = 1x2001 complex
      4.4760 - 0.0000i    4.4697 - 0.2238i ...

difference = 1x2001
10^-14 x
      0.0936    0.1777    0.0931    0.1256    0.0555 ...

ans = 2.3915e-15
```

EXERCISE 3

(Source Code)

```
1    f0 = 5;
2
3    t = -0.5:0.001:0.5;
4    y = cos(2*pi*f0*t); % original signal
5
6    %%% sampling by 8 Hz %%%
7    f1 = 8;
8    t1 = -0.5:1/f1:0.5;
9
10   yn_1 = cos(2*pi*f0*t1);
11   yr_1 = zeros(1, length(t));
12
13   for i = 1:length(t1)
14       yr_1 = yr_1 + yn_1(i)*sinc((t - i/f1)*f1);
15   end
16
17   %%% sampling by 12 Hz %%%
18   f2 = 12;
19   t2 = -0.5:1/f2:0.5;
20
21   yn_2 = cos(2*pi*f0*t2);
22   yr_2 = zeros(1, length(t));
23
24   for i = 1:length(t2)
25       yr_2 = yr_2 + yn_2(i)*sinc((t - i/f2)*f2);
26   end
27
```

(Result)