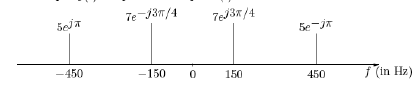
**Problem 1**

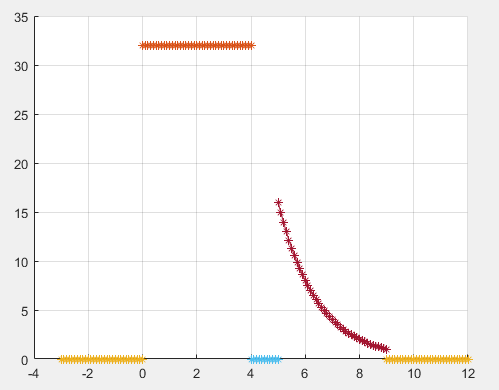
a)

b) The minimum sampling rate is equal to to avoid aliasing. Therefore, the minimum sampling rate must be .

c)



**Problem 2**



a)

t1 = 0:.1:4;

t2 = 5:.1:9;

grid on; hold on

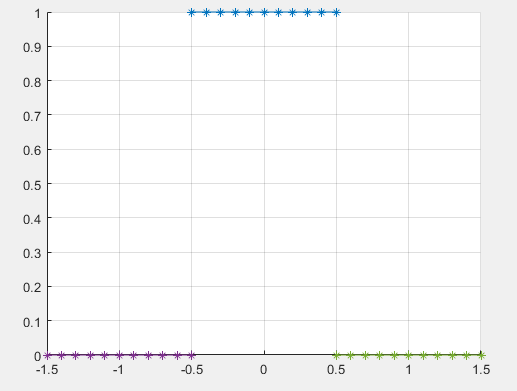
plot(-3:.1:0, zeros(length(-3:.1:0)), '\*-')

plot(t1, 32\*ones(length(t1)), '\*-')

plot(4:.1:5, zeros(length(4:.1:5)), '\*-')

plot(t2, (32.\*0.5.^(t2-4)), '\*-')

plot(9:.1:12, zeros(length(9:.1:12)), '\*-')

b)

tt = -0.5 : .1 : 0.5;

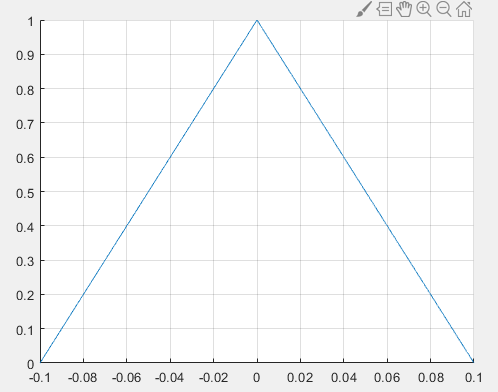
grid on; hold on

plot(-1.5:.1:-0.5, zeros(length(-1.5:.1:-0.5)), '\*-')

plot(tt, ones(length(tt)), '\*-')

plot(0.5:.1:1.5, zeros(length(0.5:.1:1.5)), '\*-')

c)



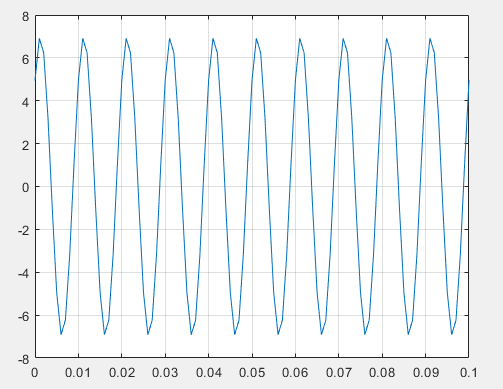
tt = -0.1 : .00001 : 0.1;

grid on; hold on

plot(tt, 1-10.\*abs(tt))

**Problem 3**

a)



fs = 1000;

tt = 0:1/fs:.1;

xx = 7\*cos(1800\*pi\*tt + (pi/4));

plot(tt, xx)

grid on

b)

t2 = 0 : 1/1000 : 5;

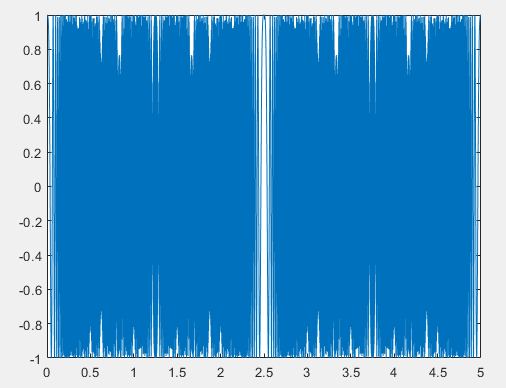
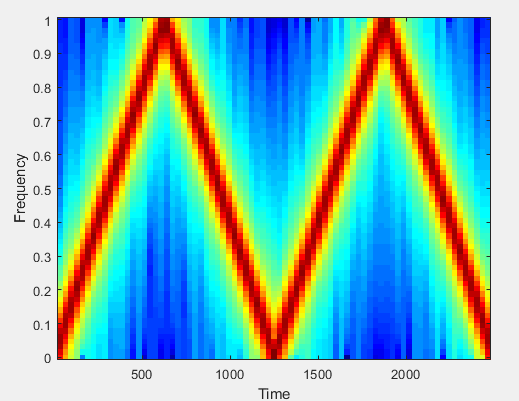
x2 = cos(2000 .\* pi .\* t2 - 400 .\* pi .\* t2.^2);

figure

plot(t2,x2)

figure

specgram(x2,128)



**Problem 4**

a) The sampling frequency is at least twice the maximum frequency – i.e. there is no aliasing/no lost information between x(t) and y(t).

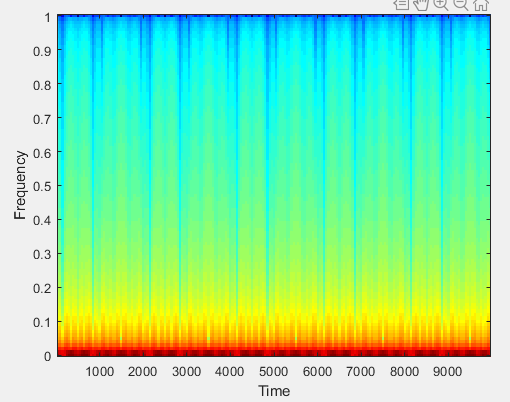
b)

t1 = 0 : 1/2000 : .1;

x1 = 3 \* cos(2\*pi\*50\*t1 - pi/2) + 2\*cos(2\*pi\*300\*t1);

t2 = 0 : 1/200000 : .1;

x2 = 3 \* cos(2\*pi\*50\*t2 - pi/2) + 2\*cos(2\*pi\*300\*t2);

hold on

plot(t1, x1)

plot(t2, x2)

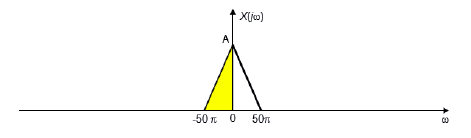
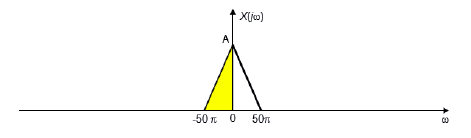
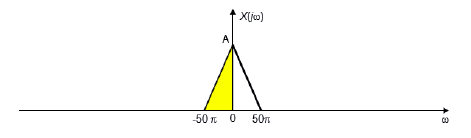
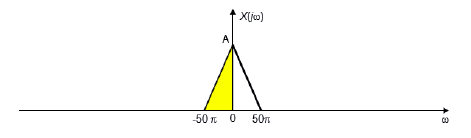
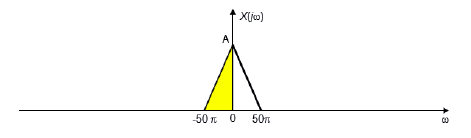
grid on

specgram(x2, 200)

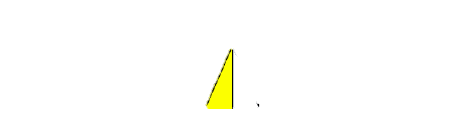
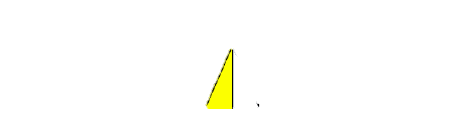
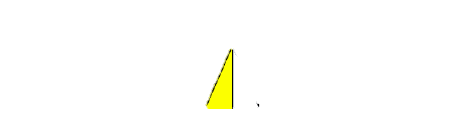
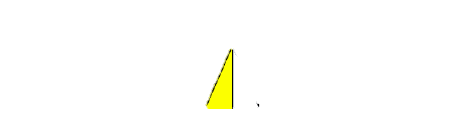
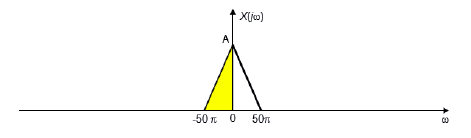
c) If the sampling rate is less than the Nyquist rate (

**Problem 5**

a) Sampling frequency must be at least



b)



c)

**Problem 6**

ai)

aii)

aiii)

aiv)