Mikhail Grushko - BE110 - PSET 4

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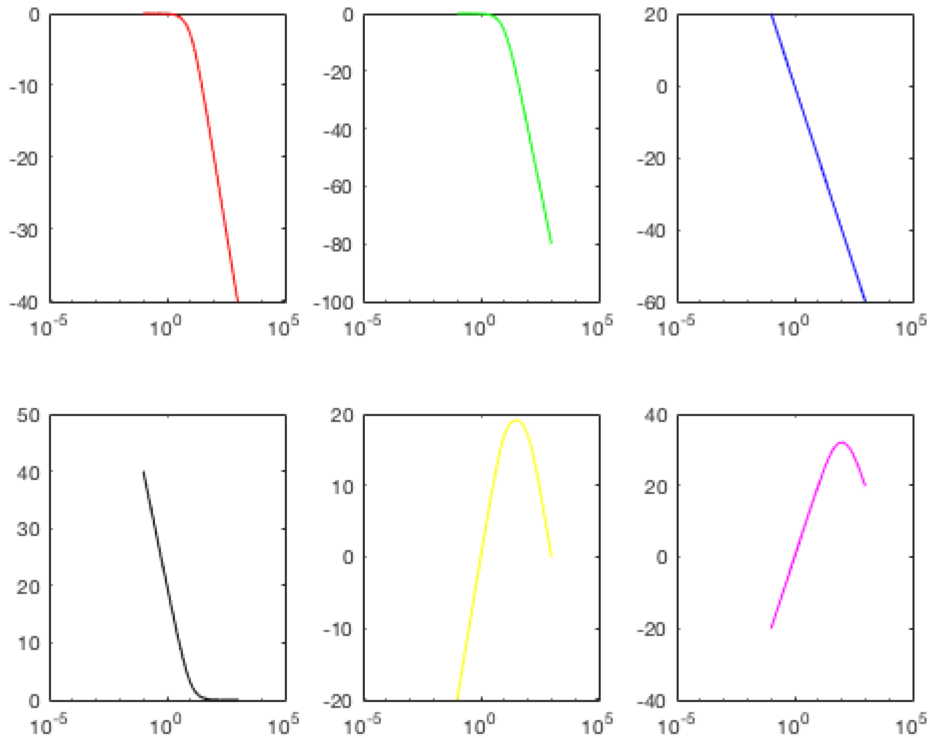
Cleanup

```
clearvars;
close all;
clc;
```

Problem 9

```
j = sqrt(-1);
w = 10.^(-1 : 0.01 : 3); % define j and w

figure(1);
subplot(2,3,1);
H=1./(j*w/10+1);
Hdb=20*log10(abs(H));
plot(w,Hdb,'r');
set(gca,'xscale','log')% define H & make the plot

subplot(2,3,2);
H=1./(j*w/10+1).^2;
Hdb=20*log10(abs(H));
plot(w,Hdb,'g');
set(gca,'xscale','log')% define H & make the plot

subplot(2,3,3);
H=1./(j*w);
Hdb=20*log10(abs(H));
plot(w,Hdb,'b');
set(gca,'xscale','log')% define H & make the plot

subplot(2,3,4);
H=(10./(j*w))+1;
Hdb=20*log10(abs(H));
plot(w,Hdb,'k');
set(gca,'xscale','log')% define H & make the plot

subplot(2,3,5);
H=(j*w)./(((j*w./10) + 1).*((j*w./100) + 1));
Hdb=20*log10(abs(H));
plot(w,Hdb,'y');
set(gca,'xscale','log')% define H & make the plot
```

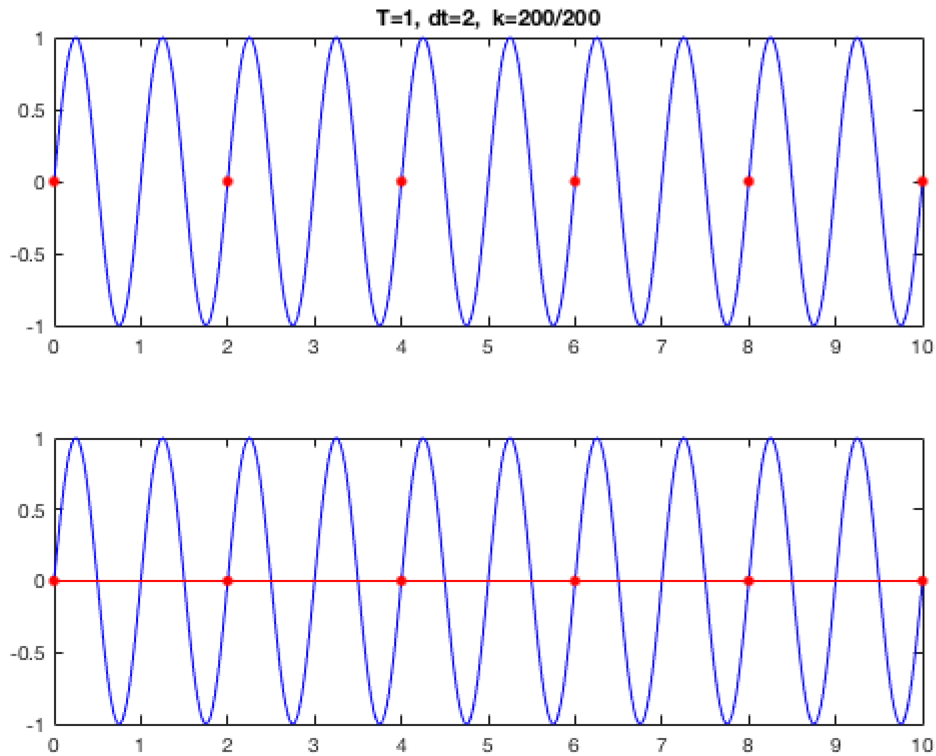
```
subplot(2,3,6);
H=(j*w)./(((j*w./50) + 1).*((j*w./200) + 1));
Hdb=20*log10(abs(H));
plot(w,Hdb,'m');
set(gca,'xscale','log')% define H & make the plot
```



Problem 10

```
figure;
t=0:.01:10;
x=sin(2*pi*t);
% define t with an initial sampling interval dt=0.01 and define x(t)to
 have
% period=1
for k=1:200
% for loop that incrementally changes the sampling interval
    is=1:k:length(t);
    ts=t(is);
    xs=x(is);
    %set the new dt tok*dt&then plot the original x (blue) and the
 sampled x(red)
    subplot(211);
    plot(t,x,'-b',ts, xs,'.r','markersize',16);
    title(['T=1, dt=',num2str(k*0.01), ',  k=',num2str(k),'/200']);
    subplot(212); plot(t,x,'-b',ts, xs,'.-r','markersize',16); pause
```

```
    % hit the SPACEBAR to advance to next plot
end
% this code flips thorough sampling rates.  The lower plots is the
 same as
% the upperbut with the reddots connected
```



\textbf{10a:} As I am flipping through the sampling frequencies, I observe the effect known as aliasing. Aliasing is generally observed in the Discrete-Time Fourier Transform, where only a single fundamental sampling frequency ω_o. At higher ω_o (significantly higher than period T), the DTFT does an accurate job of representing the original wave. However, at $\omega_o = 0.5T$, aliasing effect begins to occur, due to the fact that one cannot unambiguously interpret the samples, creating multiple signals that are aliases of each other (i.e. all of the aliases can produce the sampling obtained.

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