

EE432 Fall 2009 PS01: Solutions

1. Chirp function

```
function [y,fs]=chirp432(timedur,flow,fhigh)
%
% function [y,fs]=chirp432(timedur,flow,fhigh)
%
% This function creates a chirp signal (y) that lasts for "timedur" seconds.
% The signal increases linearly from flow Hz to fhigh Hz over that duration.
% The sample frequency of the chirp signal is returned, and is 4*the maximum of
% [flow, fhigh].
fs=4*max([flow fhigh]);
t=0:1/fs:timedur;

w=flow+t/timedur*(fhigh-flow);
y=cos(2*pi*w.*t);
```

2. Polar-Rectangular Coordinates

```
-----
function [mag,ph]=rect2polar(x,y)
% function [mag,ph]=rect2polar(x,y)
%
% This function converts a rectangular-coordinate point into a
% polar-coordinate point. phase is in deg.
mag=sqrt(x.^2+y.^2);
ph=180/pi*atan2(y,x);

-----
function [x,y]=polar2rect(mag,ph)
% function [x,y]=polar2rect(mag,ph)
%
% This function converts a polar-coordinate point into a
% rectangular-coordinate point. phase is in deg.
x=mag.*cosd(ph); % cosd computes cosine in degrees
y=mag.*sind(ph); % sind computes sine in degrees
```

3+j2: Mag: 3.6056, Phase: 33.6901 deg

-2+j3: Mag: 3.6056, Phase: 123.6901 deg

5∠13 deg: Real: 4.8719, Imag: 1.1248

5∠-213 deg: Real: -4.1934, Imag: 2.7232

3. Text, prob. 3-3.

Sampling a 300 Hz sine wave at 330 samples/sec will result in an alias frequency of **30 Hz**.

4. a. The 100 Hz tonal is okay, the 200 Hz tonal aliases to 50 Hz, and the 300 Hz tonal aliases to 50 Hz.

Answer: **50 Hz.**

- b. All frequencies are < 2500 , so no aliasing occurs.

Answer: 50 Hz, 500 Hz, 1000 Hz.

- c. All frequencies are $> f_s/2$: the 2500 Hz aliases to 500 Hz, the 2800 Hz aliases to 200 Hz, the 3300 Hz aliases to 300 Hz, and the 5000 Hz aliases to 1000 Hz.

Answer: **200 Hz, 300 Hz, 500 Hz and 1000 Hz.**