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```
close all; clear all
```

## 1: Enter and run the script below. Change the values of sigma and

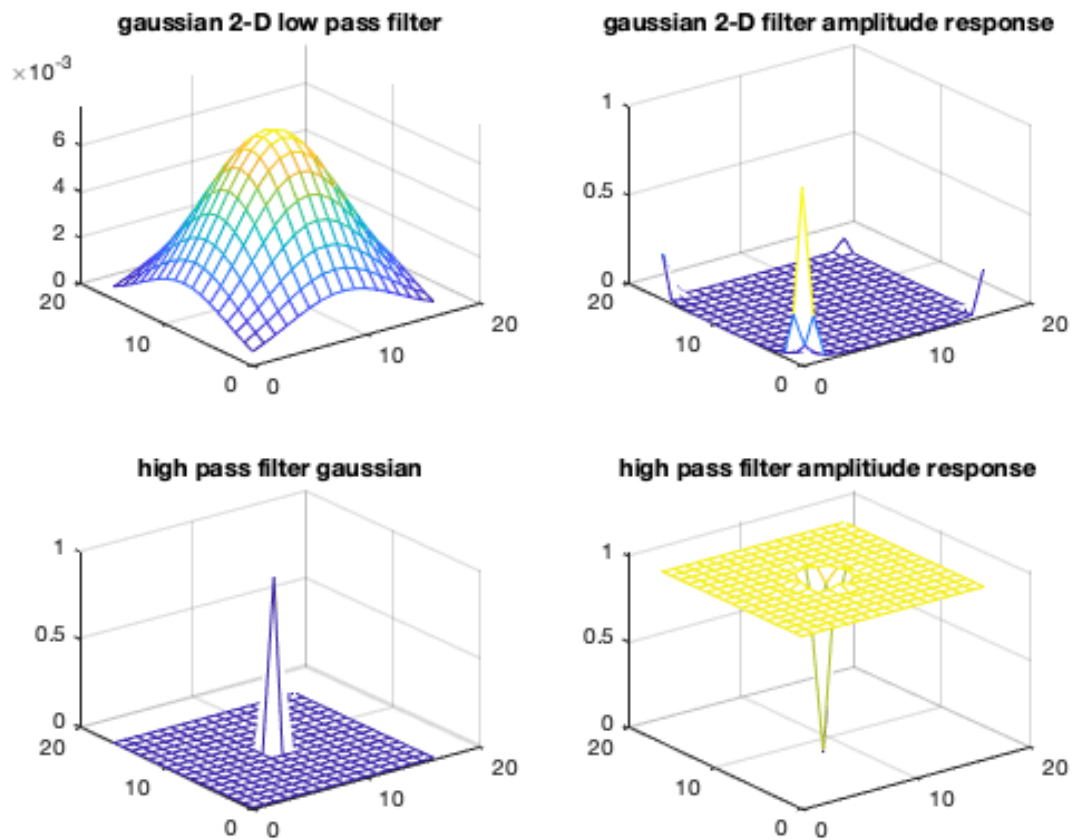
```
%subplots 3 and 4 you will have to design a complementary low-pass  
%filter (using sigma=5) and plot it and its frequency response.  
%Recall that the way to create a high pass filter is to add a central  
%delta function to the negative values of the low pass FIR filter.
```

```
figure(1); subplot(2,2,1) % low-pass gaussain spatial filter  
sigma = 5;  
m = 17; n = 17;  
flow = fspecial('gaussian',[n m],[sigma]);  
mesh(0:m-1,0:n-1,flow);  
title('gaussian 2-D low pass filter')  
subplot(2,2,2) % and its frequency response  
flow_fft = abs(fft2(flow));  
mesh(0:m-1,0:n-1,flow_fft);  
title('gaussian 2-D filter amplitude response')
```

```
subplot(2,2,3) % create high pass filter from the gaussian
```

```
flow_high = -flow;  
flow_high(9,9) = flow_high(9,9)+1;  
mesh(0:m-1,0:n-1,flow_high)  
title('high pass filter gaussian')
```

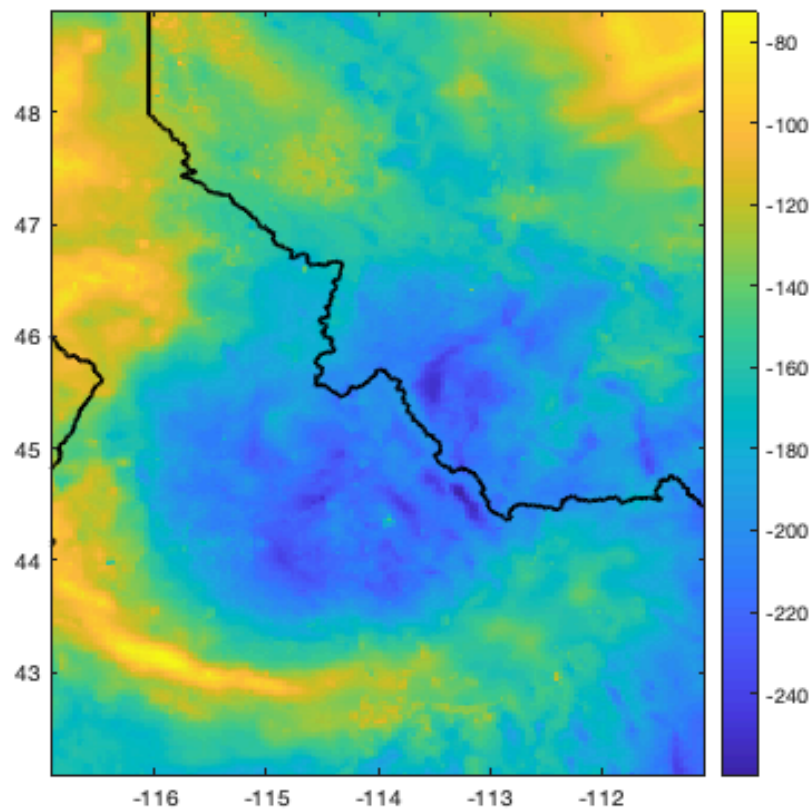
```
subplot(2,2,4) % derive the amplitude response from above  
title('high pass filter amplitude response')  
fhigh_noshift = abs(fft2(flow_high));  
fhigh_fft = fftshift(fhigh_noshift);  
mesh(0:m-1,0:n-1,fhigh_fft)  
title('high pass filter amplitude response')
```



## Problem 2 :

```
load('Idaho_grav_grid.mat')
load('grav_data.mat')

figure(2)
imagesc(lons,lats,grav);hold on
plot(Idaho.Lon, Idaho.Lat,'k', 'LineWidth',2)
set(gca, 'ydir', 'normal')
daspect([1 1 1])
c = colorbar;
```

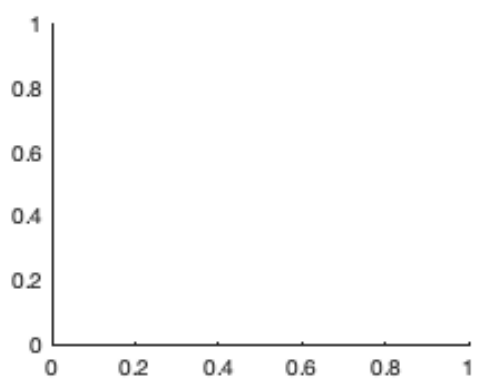


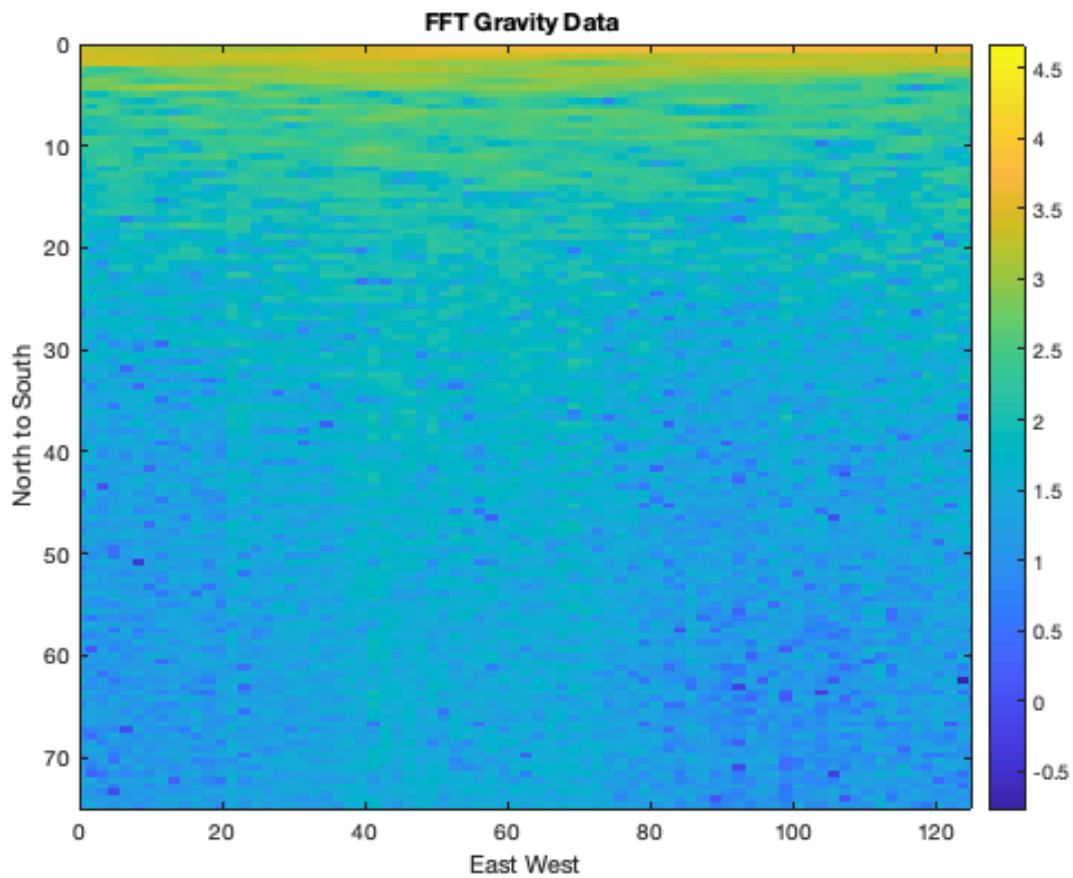
## Problem 3

```

amp = abs(fft(grav));
gspec = log10(amp);
f1 = 0:length(grav(:,1))-1;
f2 = 0:length(grav(1,:))-1;
subplot(2,2,1) % 2D fft
figure(3)
imagesc(f1,f2, gspec)
title('FFT Gravity Data ')
xlabel('East West')
ylabel('North to South')
xlim([0 125]) % this is the nyquist (east to west)
ylim([0 75]) %this is nyquist for lat (north to south)
colorbar

```





```

lp = conv2(flow, gspec);
hp = conv2(flow_high, gspec);

figure(4); clf
subplot(2,1,1)
imagesc(f1,f2,lp); % low pass
title('Low Pass Filtered FFT')
xlabel('Cycles per km by Latitude')
ylabel('Cycles per km by Longitude')

xlim([1 125])
ylim([0 75])

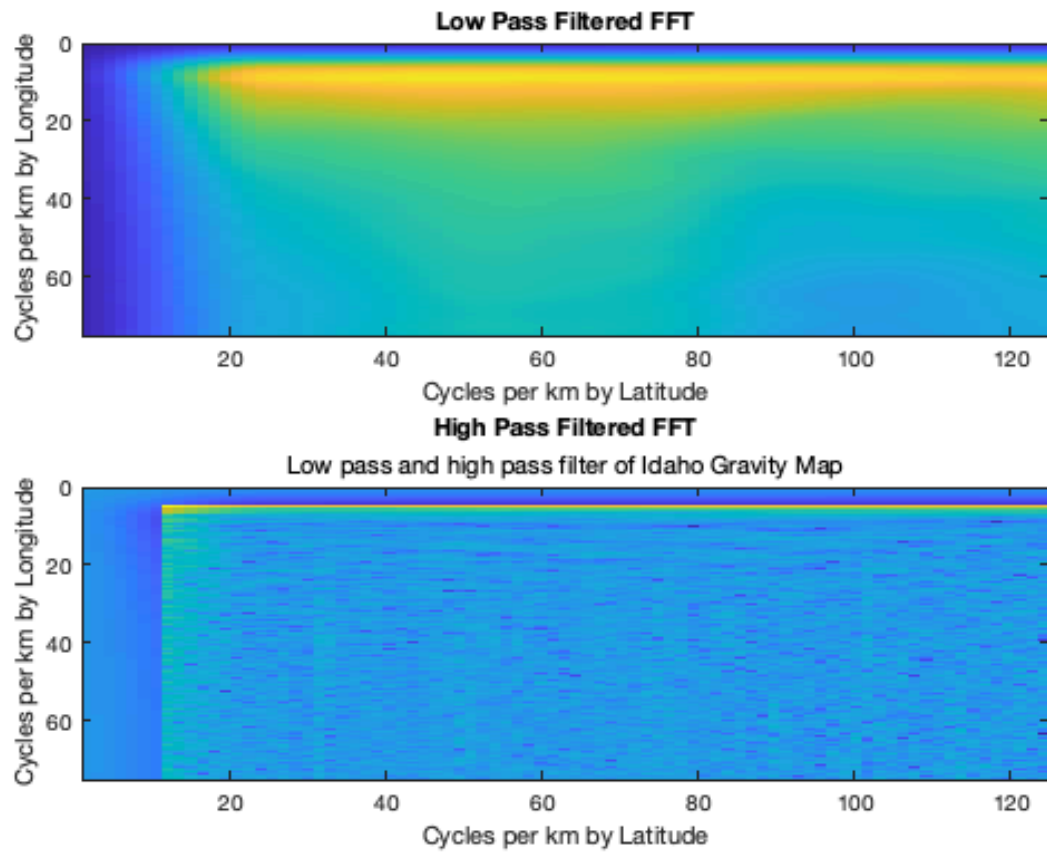
subplot(2,1,2)

imagesc(f1,f2,hp); %high pass
title('High Pass Filtered FFT')
xlabel('Cycles per km by Latitude')
ylabel('Cycles per km by Longitude')
xlim([1 125])
ylim([0 75])

```

---

```
subtitle('Low pass and high pass filter of Idaho Gravity Map')
```



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