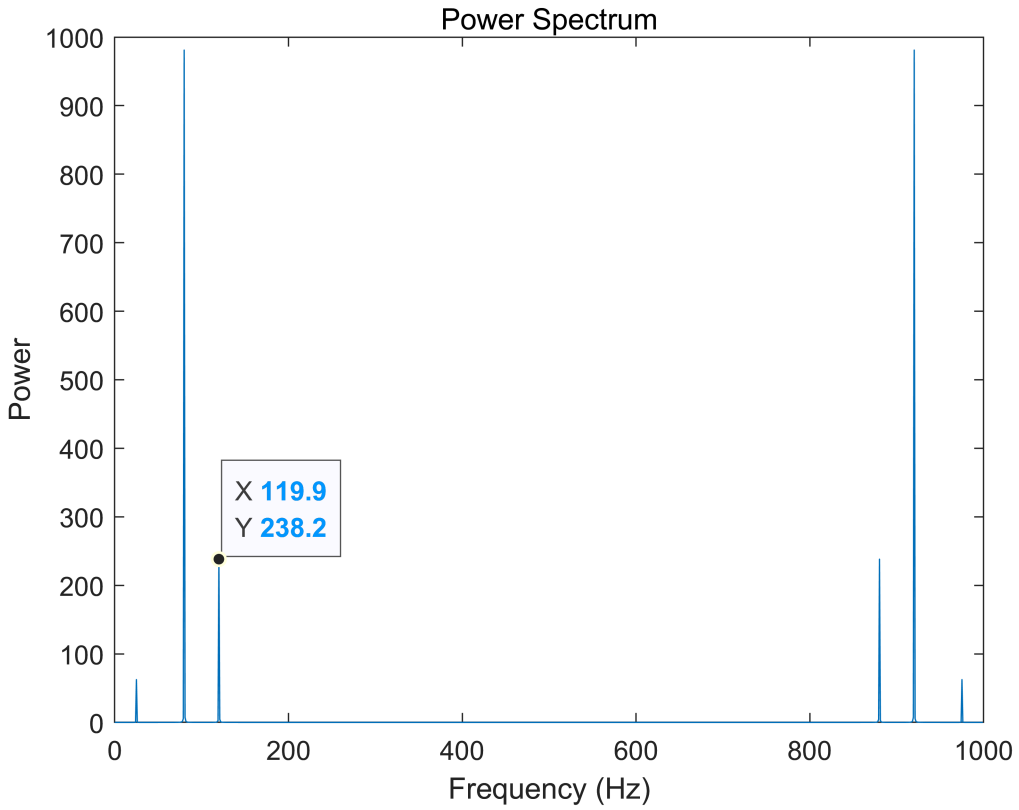
problem 3

```
clear
load DFT_example_freqData.mat

N=length(x);
psd=F.*conj(F)/N;%compute the spectrum
dx=x(2)-x(1);
freq_axis = 1/(dx*N) * [0:N-1];

plot(freq_axis,psd)
title('Power Spectrum')
xlabel('Frequency (Hz)')
ylabel('Power')
```



By focus on half of the plot, the spectrums are 24.98, 79.92 and 119.9.

```
%compute the fft matrix
F_N=zeros(N,N);
for j=1:N
    for k=1:N
        F_N(j,k)=(exp(-2*pi*1i/N))^((j-1)*(k-1));
    end
end

%recovering f_j
fj=F*F_N^(-1);
```

```
plot(x,real(fj))
title('f_j vs. x_j')
xlabel('x')
ylabel('f')
```