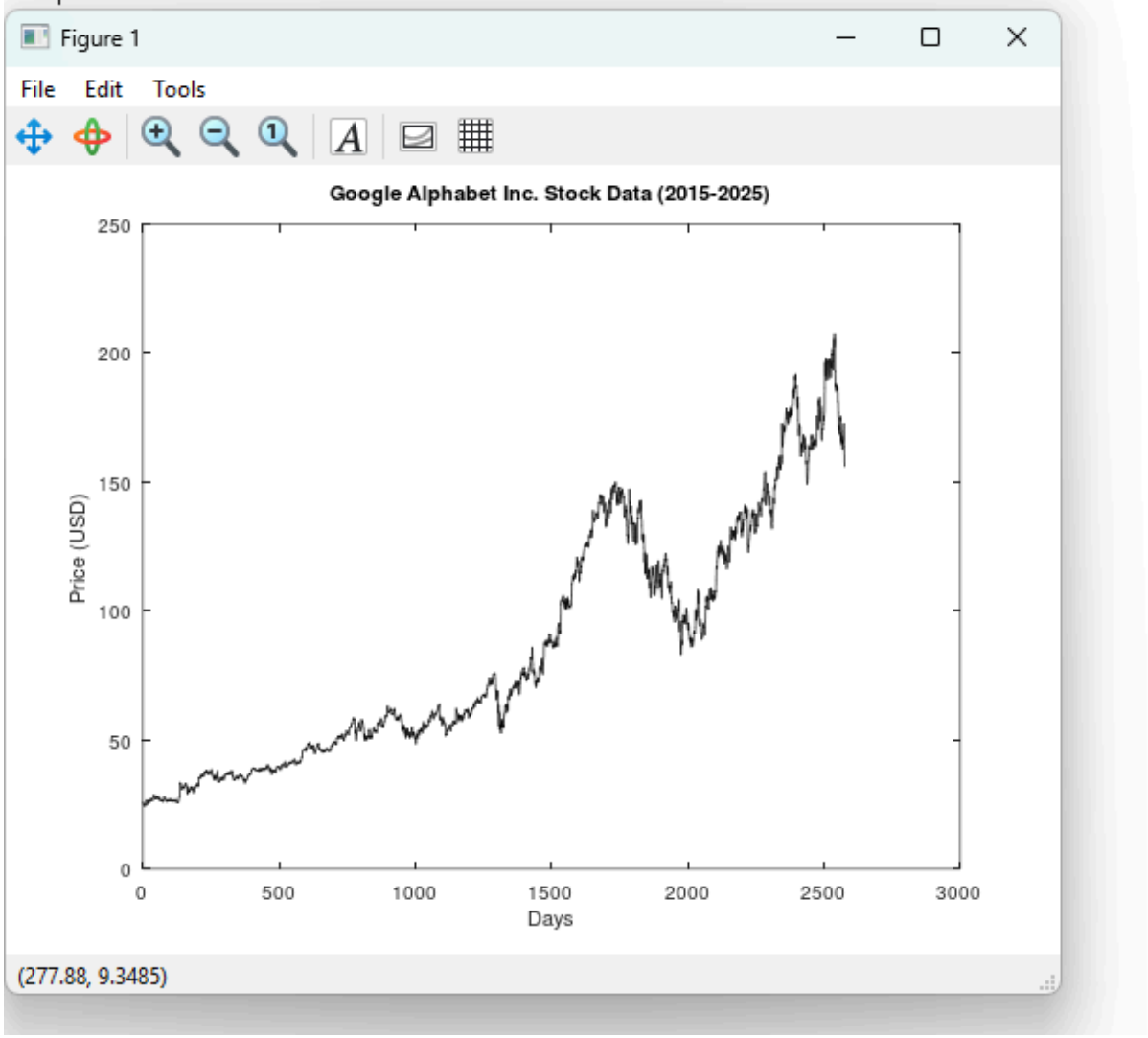
James Saw

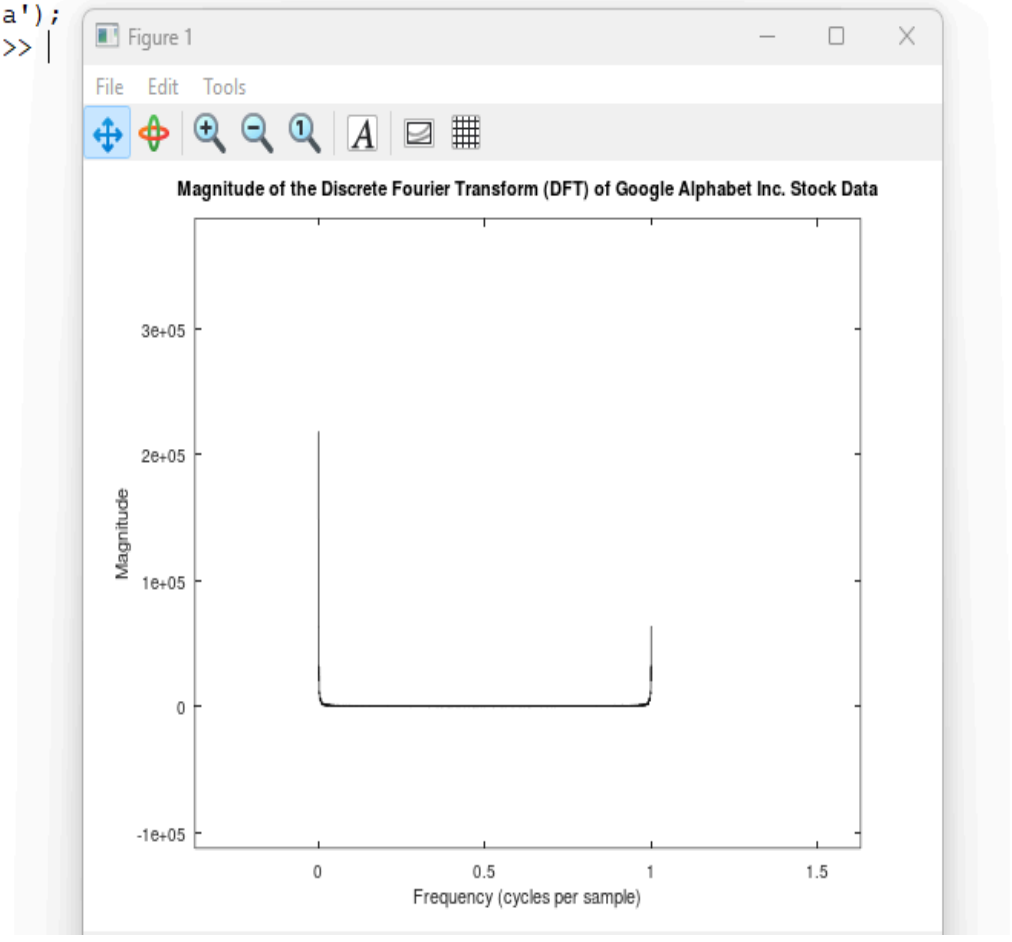
Problem 1.1

```
>> file_path = "StockData_2015_2025.csv"
file_path = StockData_2015_2025.csv
>> data = csvread(file_path);
>>
>> plot(data(:,1), data(:,2), '-', 'color', 'black');
>>
>> % labels
>>
>> xlabel('Days');
>> ylabel('Price (USD)');
>>
>> title('Google Alphabet Inc. Stock Data (2015-2025)');
>>
```



Problem 1.2

```
>> stock_prices = data(:, 2);
>> N = length(stock_prices);
>> X = zeros(N, 1);
>>
>> % DFT
>> for k = 1:N
    sum_val = 0;
    for n = 1:N
        sum_val = sum_val + stock_prices(n) * exp(-2 * pi * i * (k - 1) * (n - 1) / N);
    end
    X(k) = sum_val;
end
>>
>> magnitude = abs(X);
>> frequencies = (0:N-1) / N;
>> plot(frequencies, magnitude, '-k');
>> xlabel('Frequency (cycles per sample)');
>> ylabel('Magnitude');
>> title('Magnitude of the Discrete Fourier Transform (DFT) of Google Alphabet Inc. Stock Dat
a');
>>
```

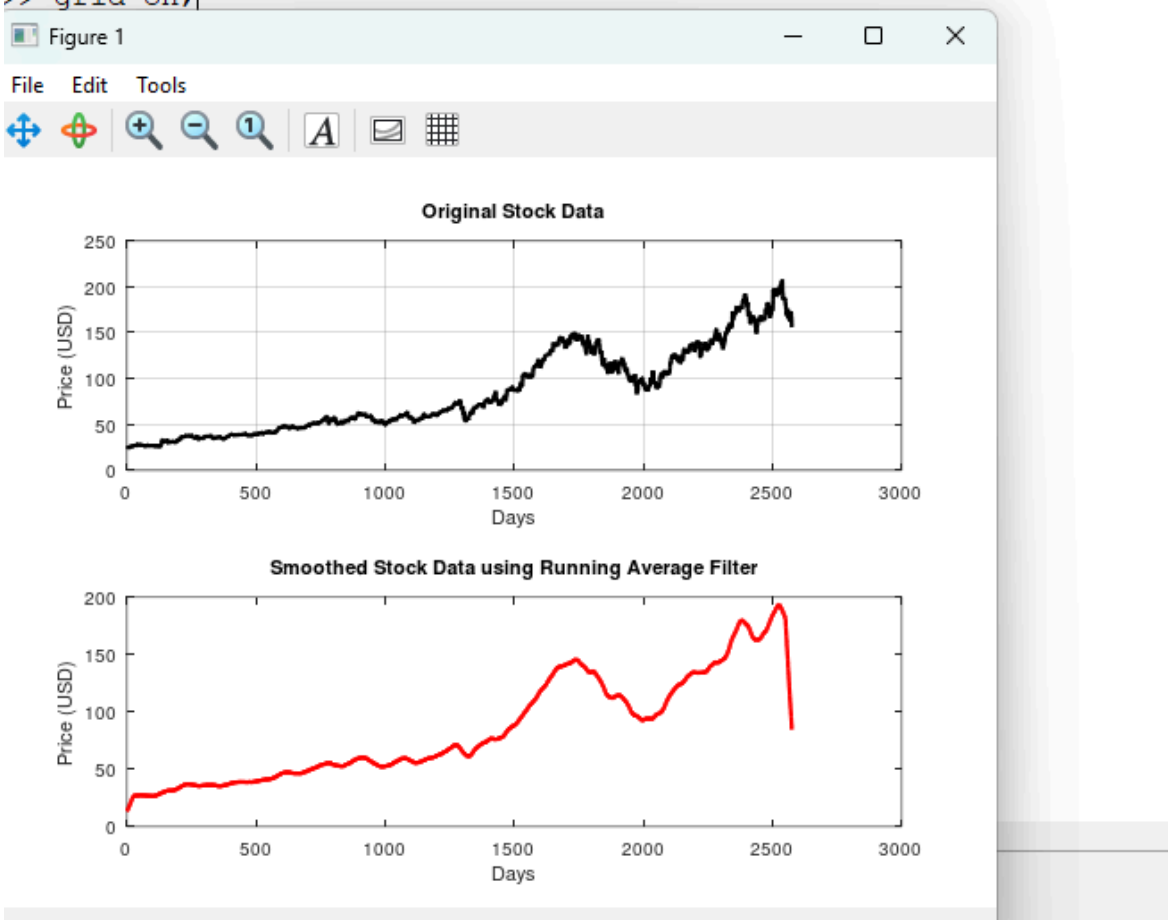


Problem 1.3

Based on problem 1.2 I was not able to find any notable peaks based on my code with the exception of the peaks on the left and right side. These corresponding frequencies can be found around 0 and 1.

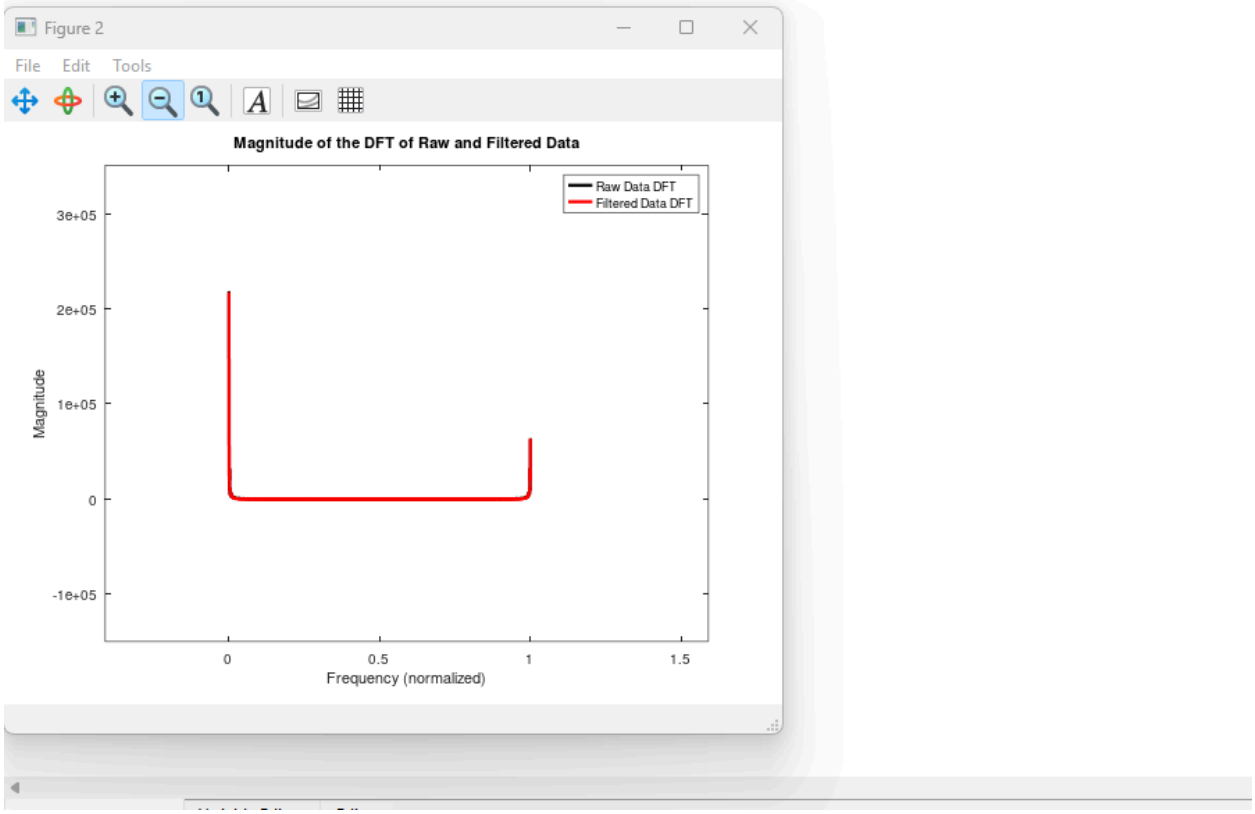
Problem 2.1

```
>> file_path = "StockData_2015_2025.csv"
file_path = StockData_2015_2025.csv
>>
>> data = csvread(file_path);
>>
>> stock_prices = data(:, 2);
>> window_size = 50;
>> kernel = ones(window_size, 1) / window_size;
>> smoothed_data = conv(stock_prices, kernel, 'same');
>>
>> figure;
>> subplot(2, 1, 1);
>> plot(stock_prices, 'color', 'black', 'linewidth', 2.0);
>> title('Original Stock Data');
>> xlabel('Days');
>> ylabel('Price (USD)');
>> grid on;
>> subplot(2, 1, 2);
>> plot(smoothed_data, 'color', 'red', 'linewidth', 2.0);
>> title('Smoothed Stock Data using Running Average Filter');
>> xlabel('Days');
>> ylabel('Price (USD)');
>> grid on;
```



Problem 2.2

```
>> kernel = ones(window_size, 1) / window_size;
>> smoothed_data = conv(stock_prices, kernel, 'same');
>> raw_dft = fft(stock_prices);
>> filtered_dft = fft(smoothed_data);
>> raw_magnitude = abs(raw_dft);
>> filtered_magnitude = abs(filtered_dft);
>> N = length(stock_prices);
>> frequencies = (0:N-1) / N;
>> figure;
>> plot(frequencies, raw_magnitude, 'k-', 'LineWidth', 2.0);  % Raw data DFT
>> hold on;
>> plot(frequencies, filtered_magnitude, 'r-', 'LineWidth', 2.0);  % Filtered data DFT
>> xlabel('Frequency (normalized)');
>> ylabel('Magnitude');
>> title('Magnitude of the DFT of Raw and Filtered Data');
>> legend('Raw Data DFT', 'Filtered Data DFT');
>> grid on;
```



Does this make sense?

Based on the graph that was made, it is difficult to see but through octave a zoom in on the line shows that the frequency has slightly lower peaks which indicates smoothing.