Nailyn Lopez
April 5
1.

```
index = 1:260;
values = [26.05, 25.5, 24.91, 24.87, 24.95, 24.62, 24.44, 24.62, 24.86, 24.9, 25.22, 25.16,
25.71, 26.52, 26.8, 26.56, 25.74, 25.31, 25.34, 26.53, 26.23, 26.27, 25.94, 26.18, 26.35, 26.2,
26.65, 26.6, 26.94, 27.25, 26.94, 26.78, 26.94, 26.75, 26.4, 26.61, 26.99, 27.57, 27.71, 28.35,
28.47, 28.46, 28.55, 28.17, 28.23, 27.54, 27.35, 27.57, 27.16, 27.52, 27.34, 27.77, 27.69, 27.81,
27.73, 28.3, 27.73, 27.55, 27.21, 27.4, 27.2, 26.93, 26.58, 26.64, 26.65, 26.88, 26.84, 26.8,
26.76, 26.32, 26.43, 26.49, 26.01, 26.57, 26.5, 26.77, 27.15, 28.04, 27.64, 27.55, 27.32, 26.74,
26.77, 26.91, 26.41, 26.09, 26.41, 26.78, 26.66, 26.33, 26.36, 26.79, 26.57, 26.49, 26.74, 26.84,
27, 26.88, 26.49, 26.86, 26.86, 26.48, 26.57, 26.83, 26.89, 26.71, 26.54, 26.22, 26.21, 26.71,
26.6, 26.49, 26.24, 26.28, 26.34, 26.71, 26.71, 26.78, 26.9, 26.77, 26.64, 26.46, 25.95, 25.9,
25.97, 26.05, 26.02, 26.13, 25.72, 25.91, 26.38, 27.2, 27.92, 27.88, 28.86, 33.49, 32.99, 32.96,
32.95, 32.06, 31.03, 31.22, 31.25, 31.45, …];
figure;
plot(index, values, '-o', 'LineWidth', 2, 'MarkerSize', 4);
title('Price Data over Days');
xlabel('Days');
ylabel('Price (USD)');
grid on;
set(gcf, 'Position', [100, 100, 800, 600]);
```

2.

```
% Data provided (index and values)
index = 1:260;
values = [26.05, 25.5, 24.91, 24.87, 24.95, 24.62, 24.44, 24.62, 24.86, 24.9, 25.22, 25.16,
25.71, 26.52, 26.8, 26.56, 25.74, 25.31, 25.34, 26.53, 26.23, 26.27, 25.94, 26.18, 26.35, 26.2,
26.65, 26.6, 26.94, 27.25, 26.94, 26.78, 26.94, 26.75, 26.4, 26.61, 26.99, 27.57, 27.71, 28.35,
28.47, 28.46, 28.55, 28.17, 28.23, 27.54, 27.35, 27.57, 27.16, 27.52, 27.34, 27.77, 27.69, 27.81,
27.73, 28.3, 27.73, 27.55, 27.21, 27.4, 27.2, 26.93, 26.58, 26.64, 26.65, 26.88, 26.84, 26.8,
26.76, 26.32, 26.43, 26.49, 26.01, 26.57, 26.5, 26.77, 27.15, 28.04, 27.64, 27.55, 27.32, 26.74,
26.77, 26.91, 26.41, 26.09, 26.41, 26.78, 26.66, 26.33,26.36, 26.79, 26.57, 26.49, 26.74, 26.84,
27, 26.88, 26.49, 26.86, 26.86, 26.48, 26.57, 26.83, 26.89, 26.71, 26.54, 26.22, 26.21, 26.71,
26.6, 26.49, 26.24, 26.28, 26.34, 26.71, 26.71, 26.78, 26.9, 26.77, 26.64, 26.46, 25.95, 25.9,
25.97, 26.05, 26.02, 26.13, 25.72, 25.91, 26.38, 27.2, 27.92, 27.88, 28.86, 33.49, 32.99, 32.96,
32.95, 32.06, 31.03, 31.22, 31.25, 31.45,31.48, 31.13, 31.41];

N = length(values); % Number of data points
Y = fft(values); % Compute the FFT
magnitude = abs(Y);
f = (0:N-1)*(1/N);
figure;
plot(f, magnitude);
title('Magnitude of the DFT of Stock Price Data');
```

```
xlabel('Frequency (Days^{-1})');
ylabel('Magnitude');
grid on;
```

3. The peaks correspond to where the frequencies show the oscillation and how much this happens.

4.

```
index = 1:260;
values = [26.05, 25.5, 24.91, 24.87, 24.95, 24.62, 24.44, 24.62, 24.86, 24.9, 25.22, 25.16,
25.71, 26.52, 26.8, 26.56, 25.74, 25.31, 25.34, 26.53, 26.23, 26.27, 25.94, 26.18, 26.35, 26.2,
26.65, 26.6, 26.94, 27.25, 26.94, 26.78, 26.94, 26.75, 26.4, 26.61, 26.99, 27.57, 27.71, 28.35,
28.47, 28.46, 28.55, 28.17, 28.23, 27.54, 27.35, 27.57, 27.16, 27.52, 27.34, 27.77, 27.69, 27.81,
27.73, 28.3, 27.73, 27.55, 27.21, 27.4, 27.2, 26.93, 26.58, 26.64, 26.65, 26.88, 26.84, 26.8,
26.76, 26.32, 26.43, 26.49, 26.01, 26.57, 26.5, 26.77, 27.15, 28.04, 27.64, 27.55, 27.32, 26.74,
26.77, 26.91, 26.41, 26.09, 26.41, 26.78, 26.66, 26.33,26.36, 26.79, 26.57, 26.49, 26.74, 26.84,
27, 26.88, 26.49, 26.86, 26.86, 26.48, 26.57, 26.83, 26.89, 26.71, 26.54, 26.22, 26.21, 26.71,
26.6, 26.49, 26.24, 26.28, 26.34, 26.71, 26.71, 26.78, 26.9, 26.77, 26.64, 26.46, 25.95, 25.9,
25.97, 26.05, 26.02, 26.13, 25.72, 25.91, 26.38, 27.2, 27.92, 27.88, 28.86, 33.49, 32.99, 32.96,
32.95, 32.06, 31.03, 31.22, 31.25, 31.45,31.48, 31.13, 31.41];

window_size = 5;
kernel = ones(1, window_size) / window_size;  % Averaging kernel
smoothed_data = conv(values, kernel, 'same'); % 'same' keeps the output the same length as
the input
figure;
hold on;
plot(index, values, '-b', 'LineWidth', 2); % Original data (unfiltered)
plot(index, smoothed_data, '-r', 'LineWidth', 2); % Smoothed data (filtered)
title('Original vs Smoothed Stock Price Data');
xlabel('Days');
ylabel('Price (USD)');
legend('Original Data', 'Smoothed Data');
grid on;
```

5.

```
% Data provided (index and values)
index = 1:260;
values = [26.05, 25.5, 24.91, 24.87, 24.95, 24.62, 24.44, 24.62, 24.86, 24.9, 25.22, 25.16,
25.71, 26.52, 26.8, 26.56, 25.74, 25.31, 25.34, 26.53, 26.23, 26.27, 25.94, 26.18, 26.35, 26.2,
26.65, 26.6, 26.94, 27.25, 26.94, 26.78, 26.94, 26.75, 26.4, 26.61, 26.99, 27.57, 27.71, 28.35,
28.47, 28.46, 28.55, 28.17, 28.23, 27.54, 27.35, 27.57, 27.16, 27.52, 27.34, 27.77, 27.69, 27.81,
27.73, 28.3, 27.73, 27.55, 27.21, 27.4, 27.2, 26.93, 26.58, 26.64, 26.65, 26.88, 26.84, 26.8,
26.76, 26.32, 26.43, 26.49, 26.01, 26.57, 26.5, 26.77, 27.15, 28.04, 27.64, 27.55, 27.32, 26.74,
```

26.77, 26.91, 26.41, 26.09, 26.41, 26.78, 26.66, 26.33,26.36, 26.79, 26.57, 26.49, 26.74, 26.84, 27, 26.88, 26.49, 26.86, 26.86, 26.48, 26.57, 26.83, 26.89, 26.71, 26.54, 26.22, 26.21, 26.71, 26.6, 26.49, 26.24, 26.28, 26.34, 26.71, 26.71, 26.78, 26.9, 26.77, 26.64, 26.46, 25.95, 25.9, 25.97, 26.05, 26.02, 26.13, 25.72, 25.91, 26.38, 27.2, 27.92, 27.88, 28.86, 33.49, 32.99, 32.96, 32.95, 32.06, 31.03, 31.22, 31.25, 31.45,31.48, 31.13, 31.41];

```
window_size = 5;
kernel = ones(1, window_size) / window_size;  % Averaging kernel
smoothed_data = conv(values, kernel, 'same'); % 'same' keeps the output the same length as the input
raw_dft = fft(values);
smoothed_dft = fft(smoothed_data);
n = length(values);
fs = 1; % sampling frequency (1 sample per day)
f = (0:n-1)*(fs/n); % frequency range
raw_dft_magnitude = abs(raw_dft(1:floor(n/2)));
smoothed_dft_magnitude = abs(smoothed_dft(1:floor(n/2)));
figure;
hold on;
plot(f, raw_dft_magnitude, '-b', 'LineWidth', 2); % Raw data DFT
plot(f, smoothed_dft_magnitude, '-r', 'LineWidth', 2); % Smoothed data DFT
title('Magnitude of DFT: Raw vs Smoothed Data');
xlabel('Frequency (Hz)');
ylabel('Magnitude');
legend('Raw Data DFT', 'Smoothed Data DFT');
grid on;
```

Yes, this data does make sense since there should be a smooth spectrum, and therefore high frequency signals.