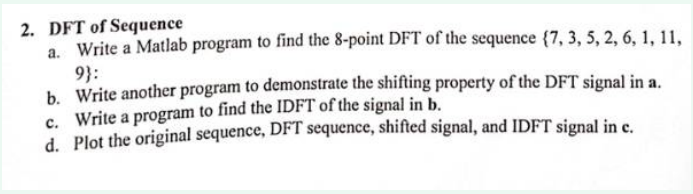
DFT in MATLAB



2. **DFT of Sequence**
   a. Write a Matlab program to find the 8-point DFT of the sequence {7, 3, 5, 2, 6, 1, 11, 9}:
   b. Write another program to demonstrate the shifting property of the DFT signal in a.
   c. Write a program to find the IDFT of the signal in b.
   d. Plot the original sequence, DFT sequence, shifted signal, and IDFT signal in c.

Great! The problem is about **DFT (Discrete Fourier Transform) of a sequence** in MATLAB. Let's go step by step:

Problem Breakdown

1. Compute **8-point DFT** of sequence $\{7, 3, 5, 2, 6, 1, 11, 9\}$.
2. Demonstrate **shifting property** of DFT.
3. Compute **IDFT** of the shifted signal.
4. Plot:
   - Original sequence
   - DFT sequence (magnitude/phase)
   - Shifted signal
   - IDFT signal

MATLAB Code

```matlab
matlab

% DFT of Sequence Problem

% Part (a): 8-point DFT of the sequence
x = [7 3 5 2 6 1 11 9];   % Original sequence
N = 8;                    % 8-point DFT
X = fft(x, N);            % Compute DFT

% Part (b): Demonstrating shifting property
% Circular shift by 2 samples (example)
x_shifted = circshift(x, 2);
X_shifted = fft(x_shifted, N);

% Part (c): Compute IDFT of shifted sequence
x_reconstructed = ifft(X_shifted, N);

% Part (d): Plot everything
figure;

subplot(2,2,1);
stem(0:N-1, x, 'filled');
title('Original Sequence');
xlabel('n'); ylabel('x[n]');
```

```
subplot(2,2,2);
stem(0:N-1, abs(X), 'filled');
title('DFT Magnitude');
xlabel('k'); ylabel('|X[k]|');

subplot(2,2,3);
stem(0:N-1, x_shifted, 'filled');
title('Shifted Sequence');
xlabel('n'); ylabel('x_{shifted}[n]');

subplot(2,2,4);
stem(0:N-1, real(x_reconstructed), 'filled');
title('Reconstructed Signal (IDFT)');
xlabel('n'); ylabel('x_{reconstructed}[n]');
```

Explanation

- **`fft(x, N)`** → computes N-point DFT.
- **`circshift(x, k)`** → circularly shifts sequence by k.
- **`ifft(X, N)`** → computes inverse DFT.
- Plots are arranged to compare original, DFT, shifted, and IDFT results.

Would you like me to also **derive the DFT shifting property mathematically** (so you can include in your report), or just keep MATLAB code?