WARM-UP QUESTIONS

1. Compute and sketch the linear convolution of $x[n] * h[n]$

   $x[n]$: 1 1 1 1 1 1 1 1 1 1
   $h[n]$: 1 2 3 4 5

2. Compute the 8-IT circular convolution of $x_0[n] + h[n]$: $x_0[n]$: 1 1 1 1 1 1 1 1 $h[n]$: 1 2 3 4 5

   (You may want to interpret $x_0[n]$ and $h[n]$ as linear convolution plus aliasing.)
**OVERLAP-ADD METHOD**

**INPUT DATA**
\[ x[n] \]

\[ \tilde{x}[n] \]

\[ x[n] \]

\[ \tilde{y}[n] \]

\[ y[n] \]

**OUTPUT DATA**

\[ y_0[n] \]

\[ y_1[n] \]

\[ y_2[n] \]

\[ y_p[n] \]

**DEFT SIZE = \( N = L + P - 1 \)**

**DATA BLOCK SIZE = \( L \)**

**FILTER LENGTH = \( P \)**

**NOTE:** MATLAB's FFT/IFFT USES THE OVERLAP-ADD SOLUTION.

**OVERLAP-SAVE METHOD**

**INPUT DATA**
\[ x[n] \]

\[ \tilde{x}[n] \]

\[ x[n] \]

\[ \tilde{x}[n] \]

\[ x[n] \]

\[ \tilde{x}[n] \]

**OUTPUT DATA**

\[ y_0[n] \]

\[ y_1[n] \]

\[ y_2[n] \]

\[ y_p[n] \]

**DEFT SIZE = \( N \)**

**DATA BLOCK SIZE = \( L \)**

**FILTER LENGTH = \( P \)**

\( (\text{window} \ P-1 \text{ Pts from Prev. Block} \)

\( \text{Plus} \ L-P+1 \text{ New Pows} \)
2) Assuming you can use 8-pt DFT's, show how to implement OL-ADD for $x[n] + h[n]$ defined in (1).
   a) How many input blocks are there? Sketch them.

   b) Show result of convolving $x_p[n]$ @ $h[n]$ for each block.

   c) Add up to obtain result ($y[n]$)

4) Assuming 8-pt DFT's, show how to implement OL-SAVE for $x[n] + h[n]$ defined in (1).
   a) How many input blocks are there? Sketch them.

   b) Show result of convolving $x_p[n]$ @ $h[n]$

   c) Patch together to obtain result ($y[n]$)

Question: How many DFT's required for OL-ADD? OL-SAVE?
How many IFT's required for OL-ADD? OL-SAVE?