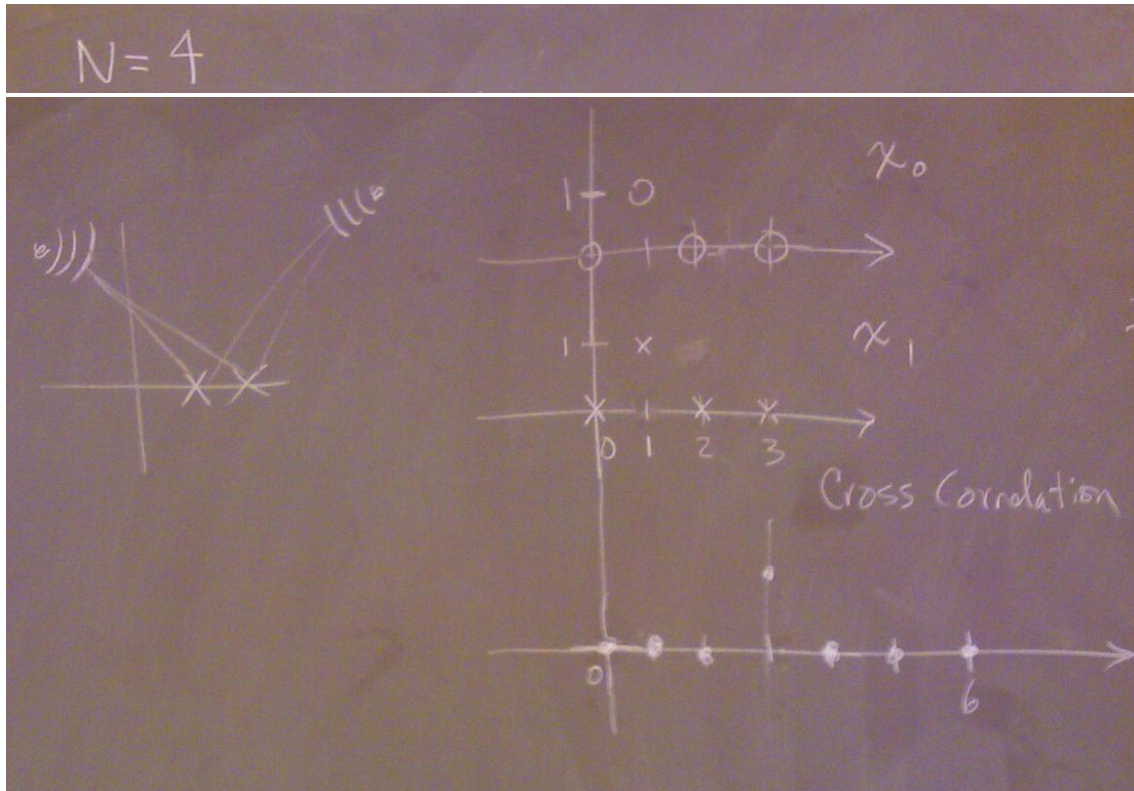


## Cross-Correlation



- Cross-Correlation is discrete convolution without reversing  $X_1$
- The middle sample of the Cross-Correlation is the point where  $X_0$  and  $X_1$  overlap completely
- The index of the middle sample for  $N=4$  is 3 or  $N-1$
- The peak in the Cross-Correlation occurs when the delayed  $X_1$  and  $X_0$  are the most similar
- The delay in samples between  $X_0$  and  $X_1$  is computed as the difference between the middle sample of the Cross-Correlation and the sample of the peak in the Cross-Correlation function
- The delay in seconds is found by dividing the delay in samples by the sample rate ( $F_s$ ):

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- LabVIEW Hints:
    - Functions -> Waveform -> Get Wfm Components to get  $dT$  (time between samples) and  $Y$  (array of scalars from the ADC) from the  $X_0$  waveform
    - Functions -> Array -> Array Size to get  $N$  – the number of samples in  $X_0$
    - Functions -> Array -> Max & Min to get the Max Index in the Cross-Correlation