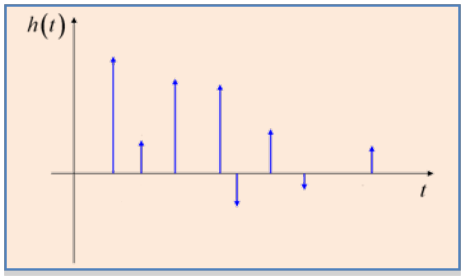
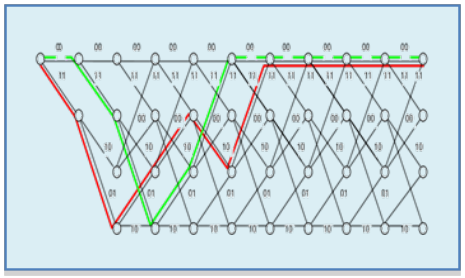
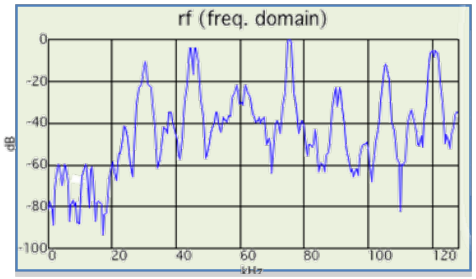
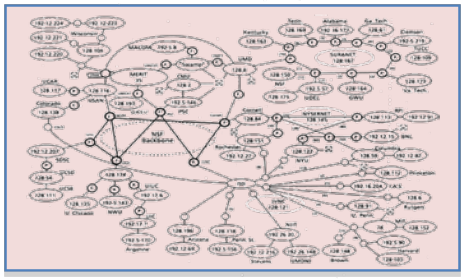








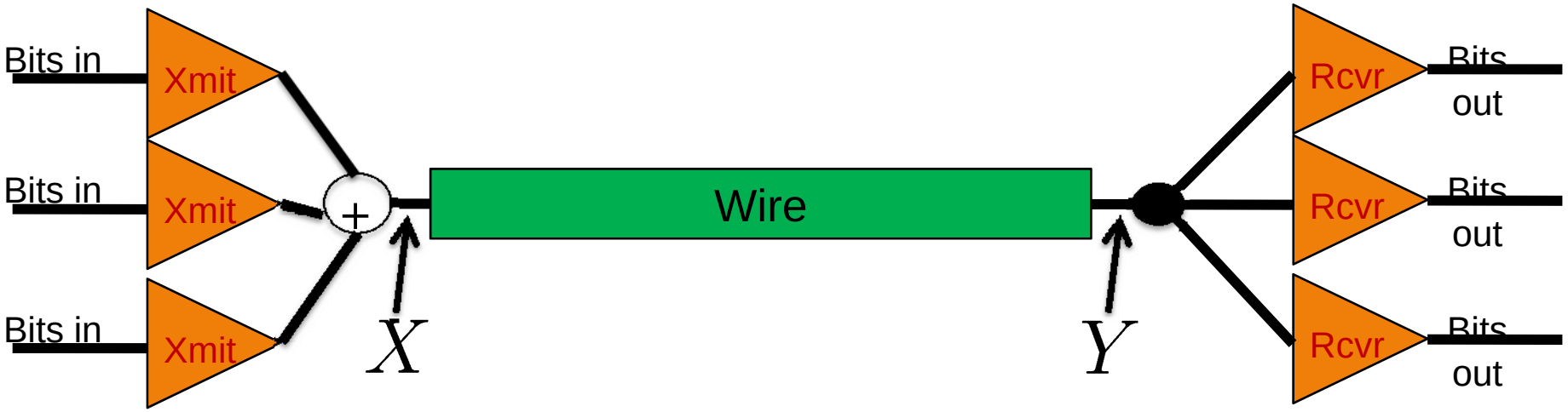
INTRODUCTION TO EECS II

DIGITAL COMMUNICATION SYSTEMS

6.02 Spring 2009
Lecture #14

- FDM and Data
- Spectrum and Discrete Fourier Transform
- DFT Examples
- Rise Time and Spectrum

Simplified Big Picture



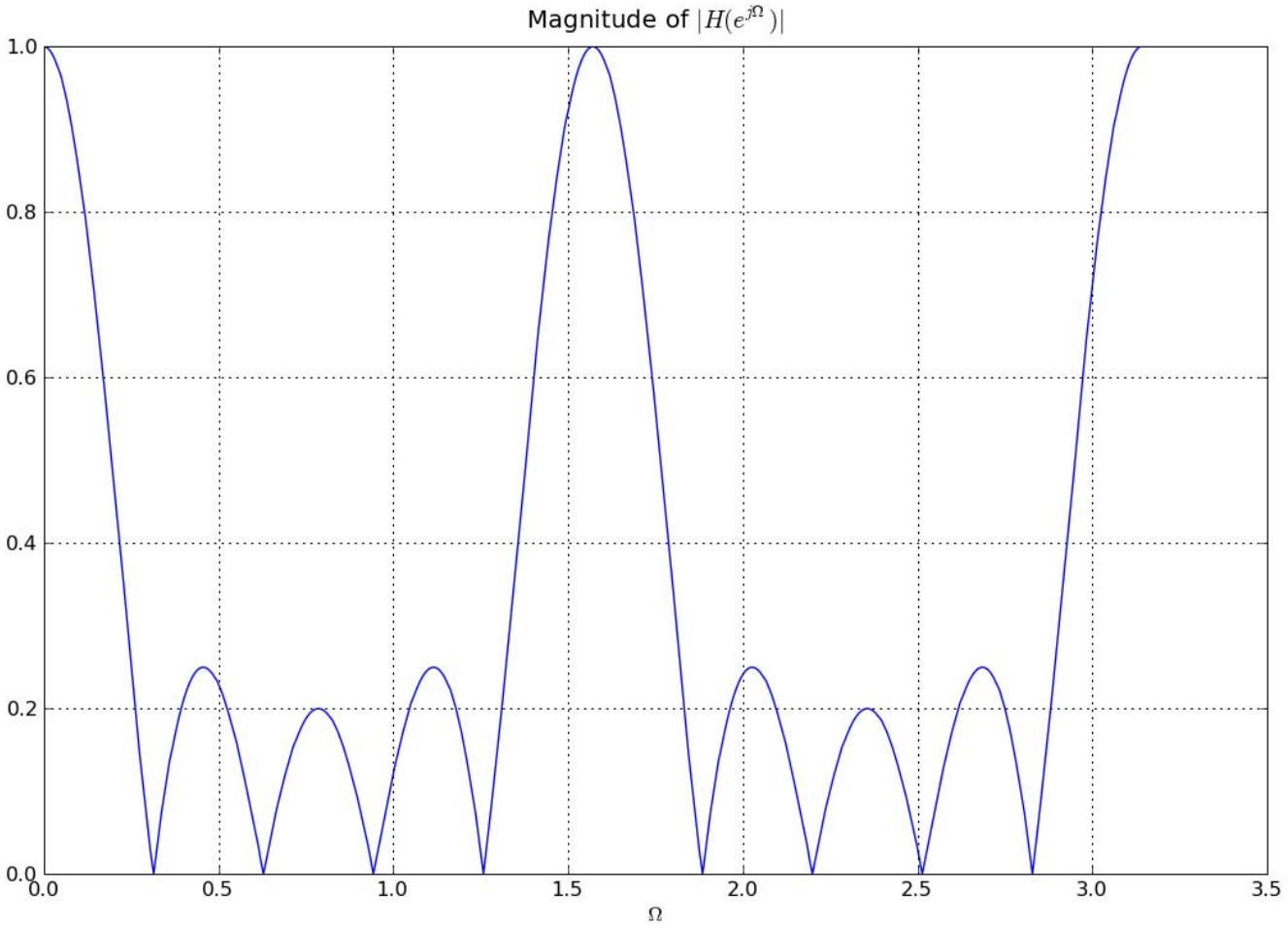
- Frequency Division Multiplexing Strategy
  - Represent each channel with a different frequency
    - For LTI systems, frequencies do not mix

$$x[n] = A_1 e^{j\Omega_1 n} + \ldots + A_K e^{j\Omega_K n}$$

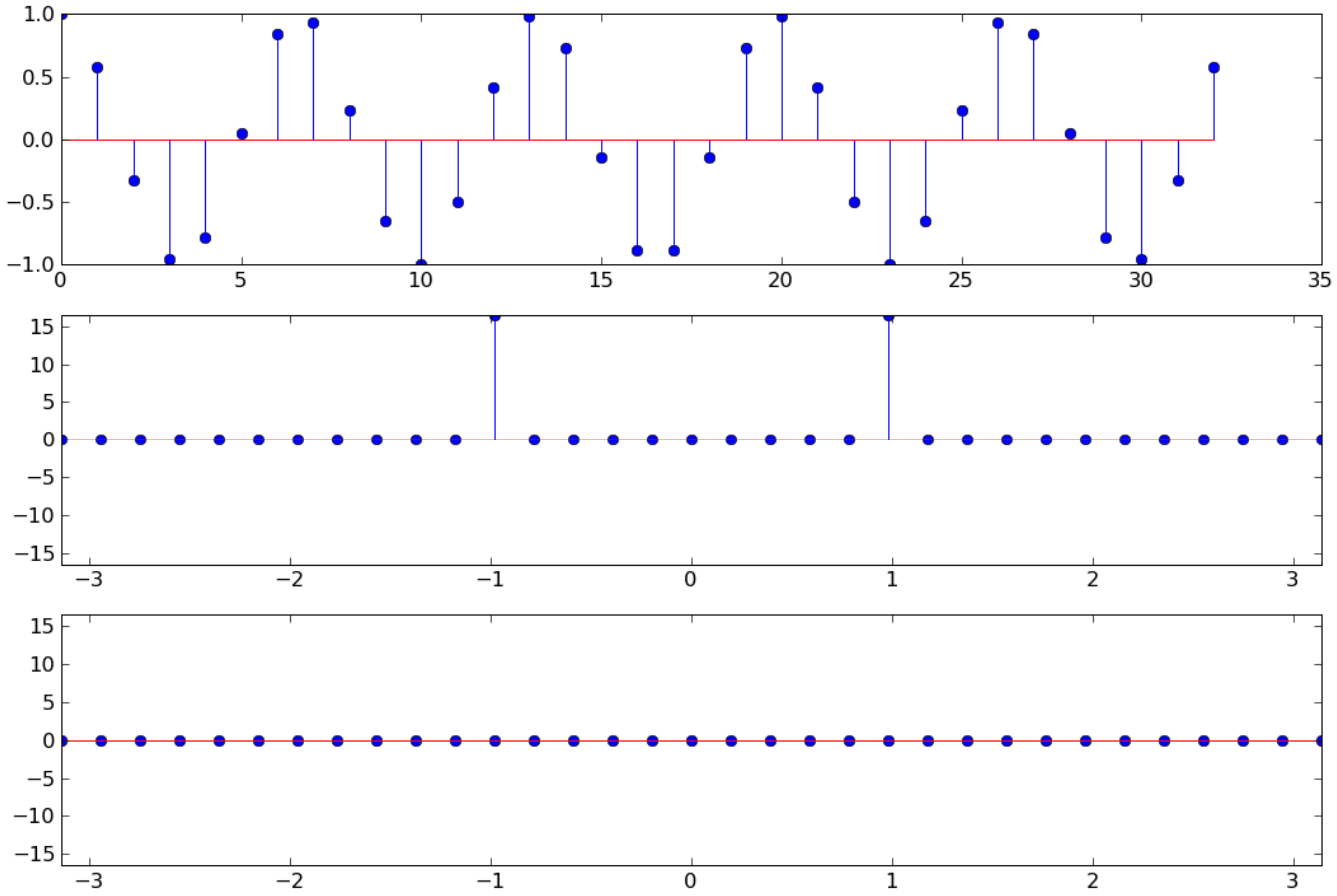
$$y[n] = H(e^{j\Omega_1}) A_1 e^{j\Omega_1 n} + \ldots + H(e^{j\Omega_K}) A_K e^{j\Omega_K n}$$

  - Use Filters to Separate Into different Channels

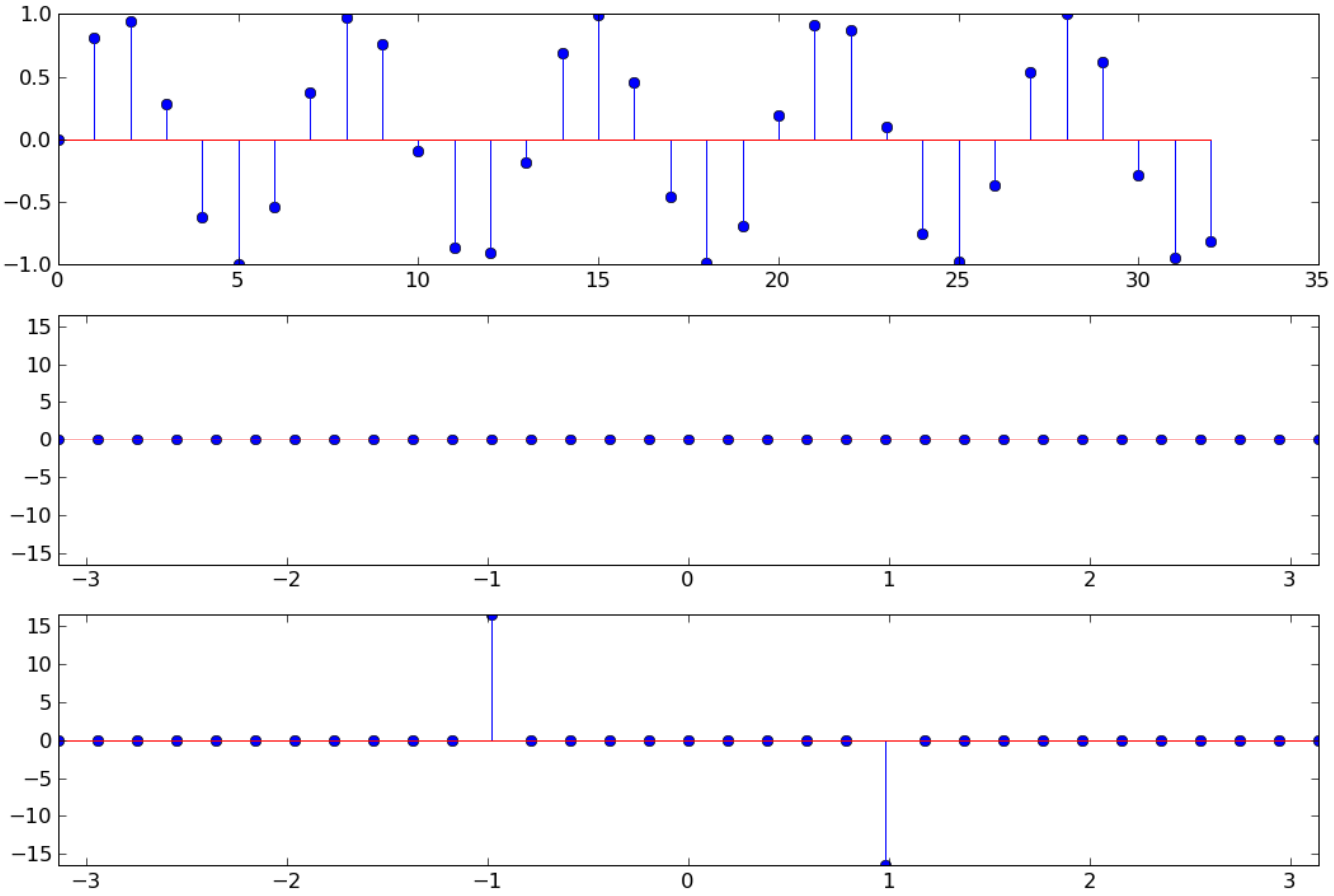
Channel 5, 8 Zeros Filter



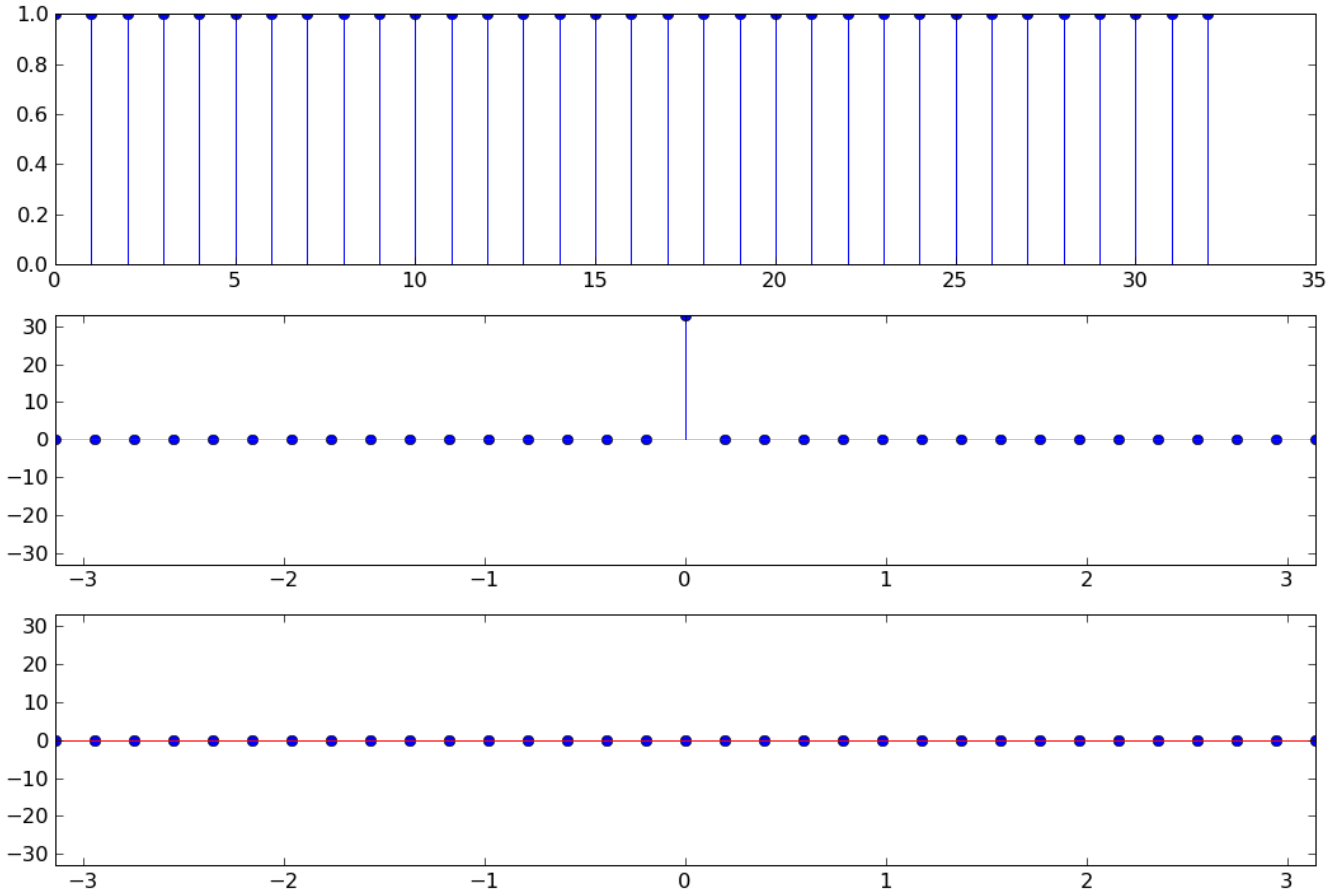
Cosine in Time, 2 real nonzero DFT values



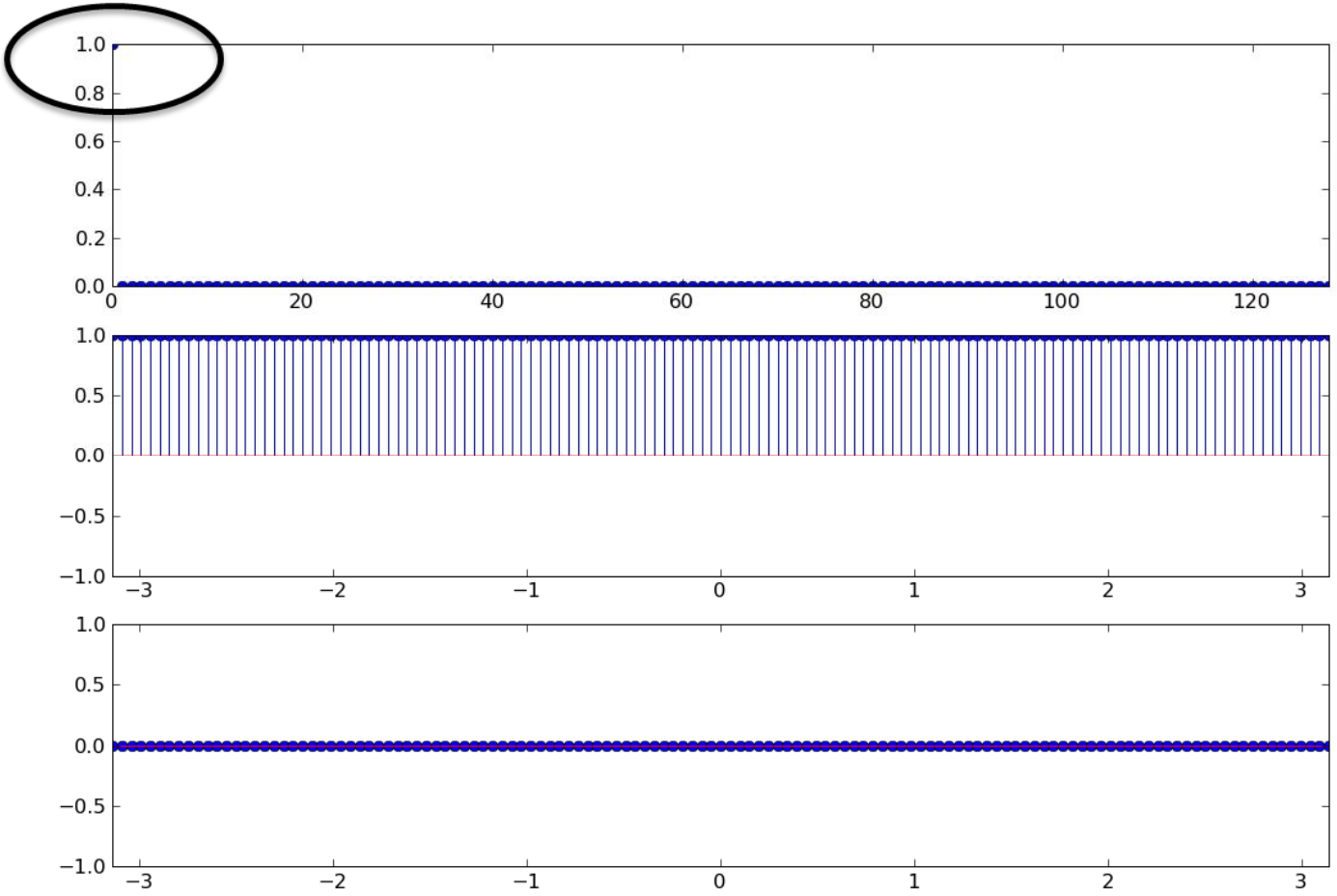
Sine in Time, 2 Imaginary DFT values



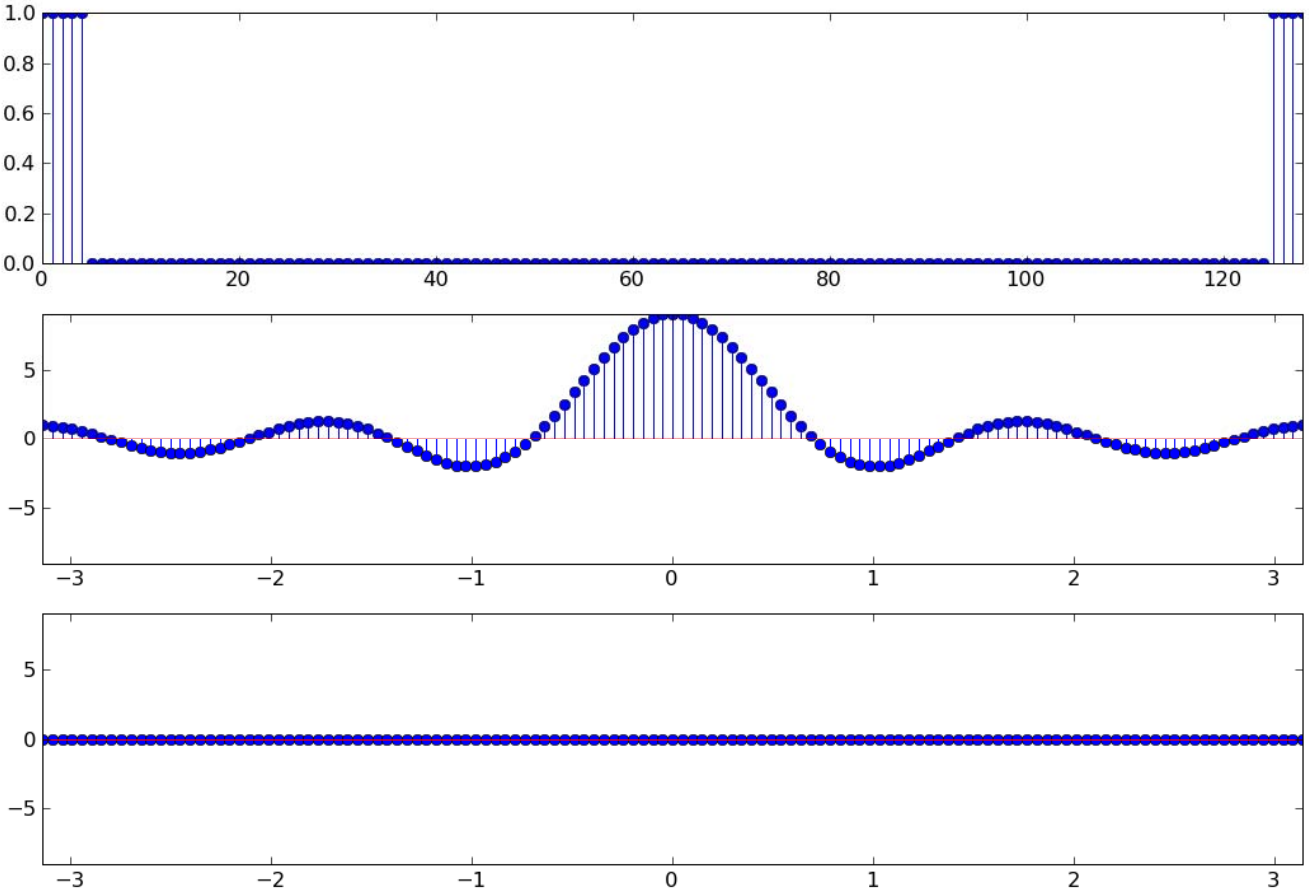
Constant in Time, one real nonzero DFT value



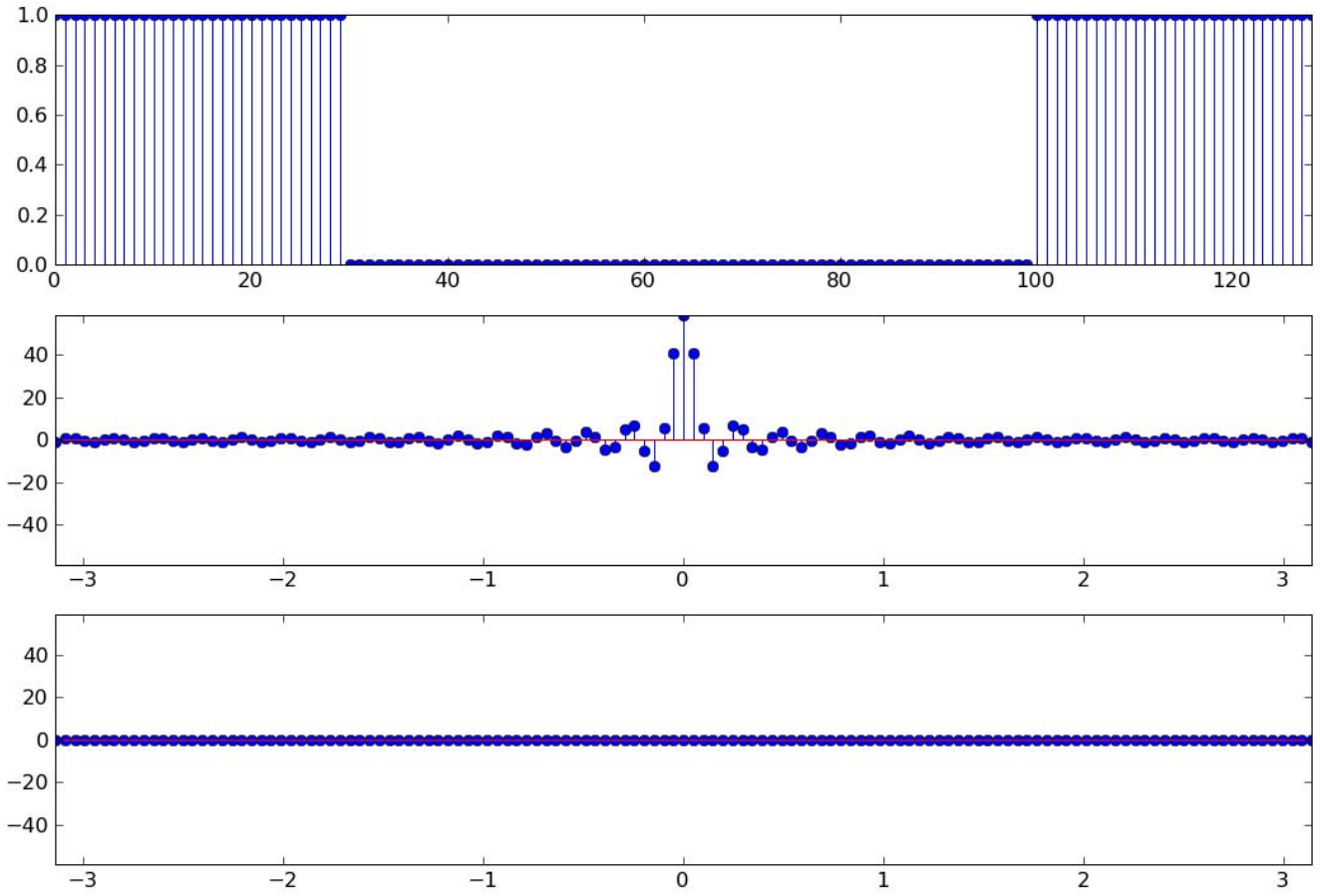
One Sample in Time, Constant DFT



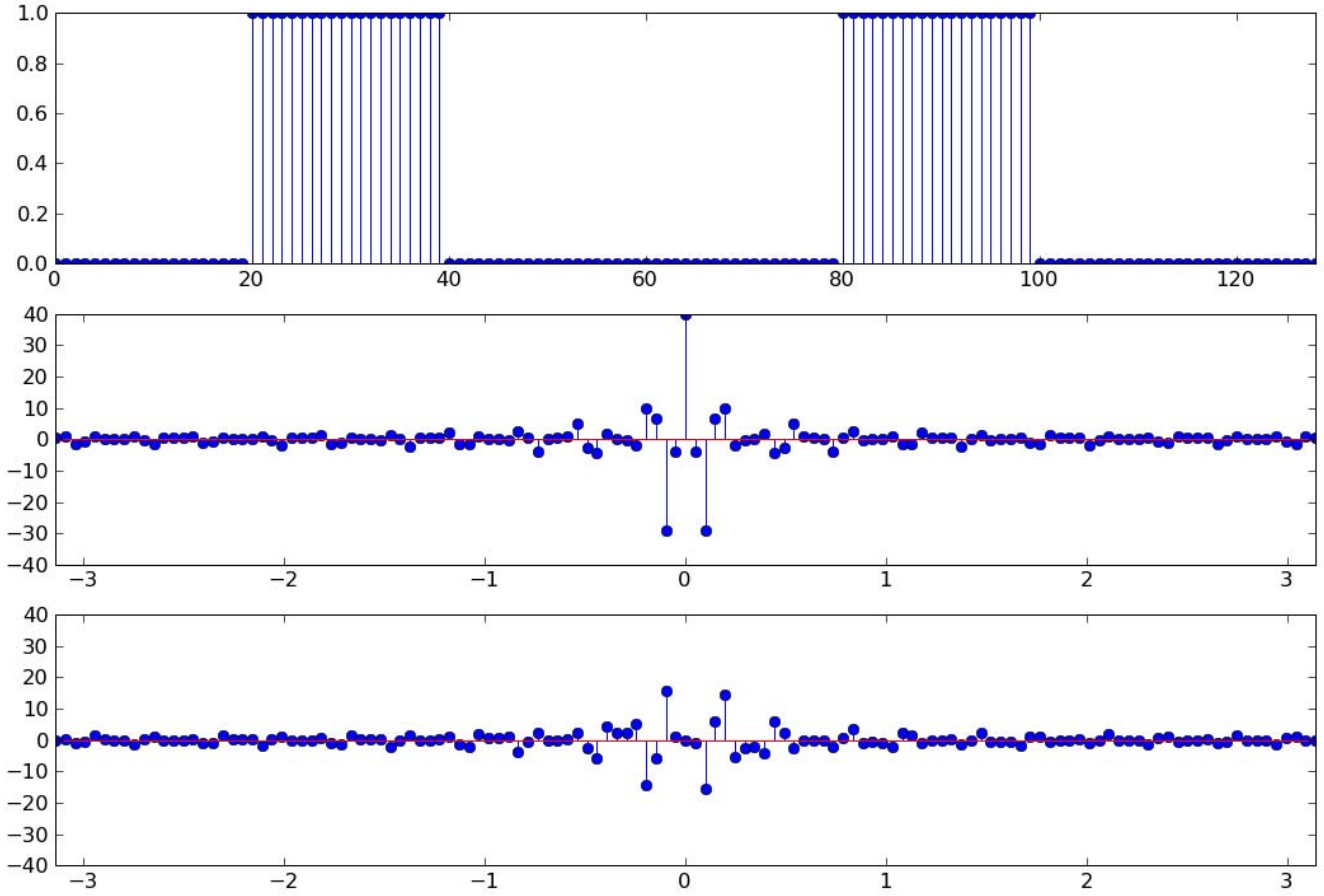
Medium Even Pulse, Real decaying DFT



Wider Even Pulse, Faster Decay



010010 Bit sequence with Fast Rise



010010 Bit sequence with Slow Rise