Inverse Discrete Fourier Transform

Images from "The Scientist and Engineer's Guide to Digital Signal Processing"

$$x[i] = \sum_{k=0}^{N/2} Re\bar{X}[k] \cos(2\pi ki/N) + \sum_{k=0}^{N/2} Im\bar{X}[k] \sin(2\pi ki/N)$$

EQUATION 8-2
The synthesis equation. In this relation, $x[i]$ is the signal being synthesized, with the index, i, running from 0 to $N-1$. $Re\bar{X}[k]$ and $Im\bar{X}[k]$ hold the amplitudes of the cosine and sine waves, respectively, with k running from 0 to $N/2$. Equation 8-3 provides the normalization to change this equation into the inverse DFT.

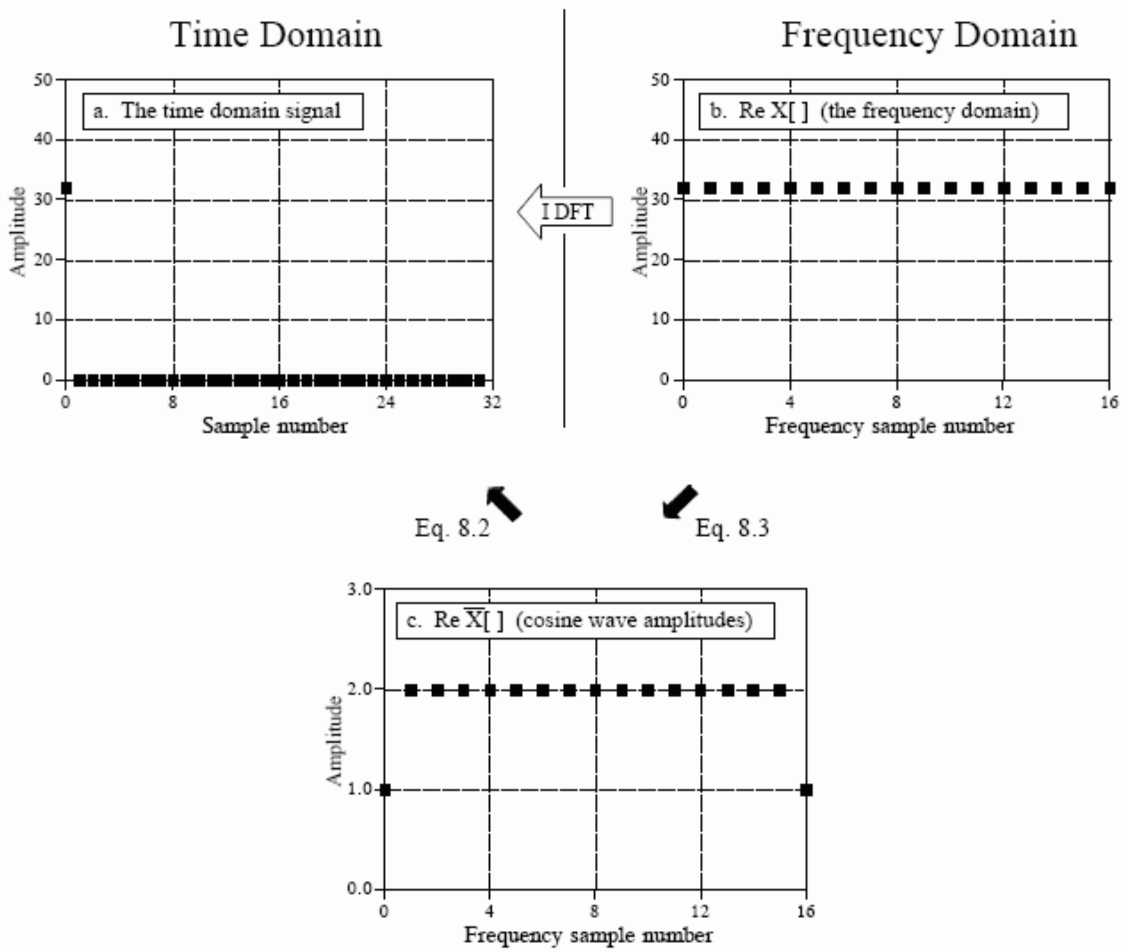

FIGURE 8-6
Example of the Inverse DFT. Figure (a) shows an example time domain signal, an impulse at sample zero with an amplitude of 32. Figure (b) shows the real part of the frequency domain of this signal, a constant value of 32. The imaginary part of the frequency domain (not shown) is composed of all zeros. Figure(c) shows the amplitudes of the cosine waves needed to reconstruct (a) using Eq. 8-2. The values in (c) are found from (b) by using Eq. 8-3.

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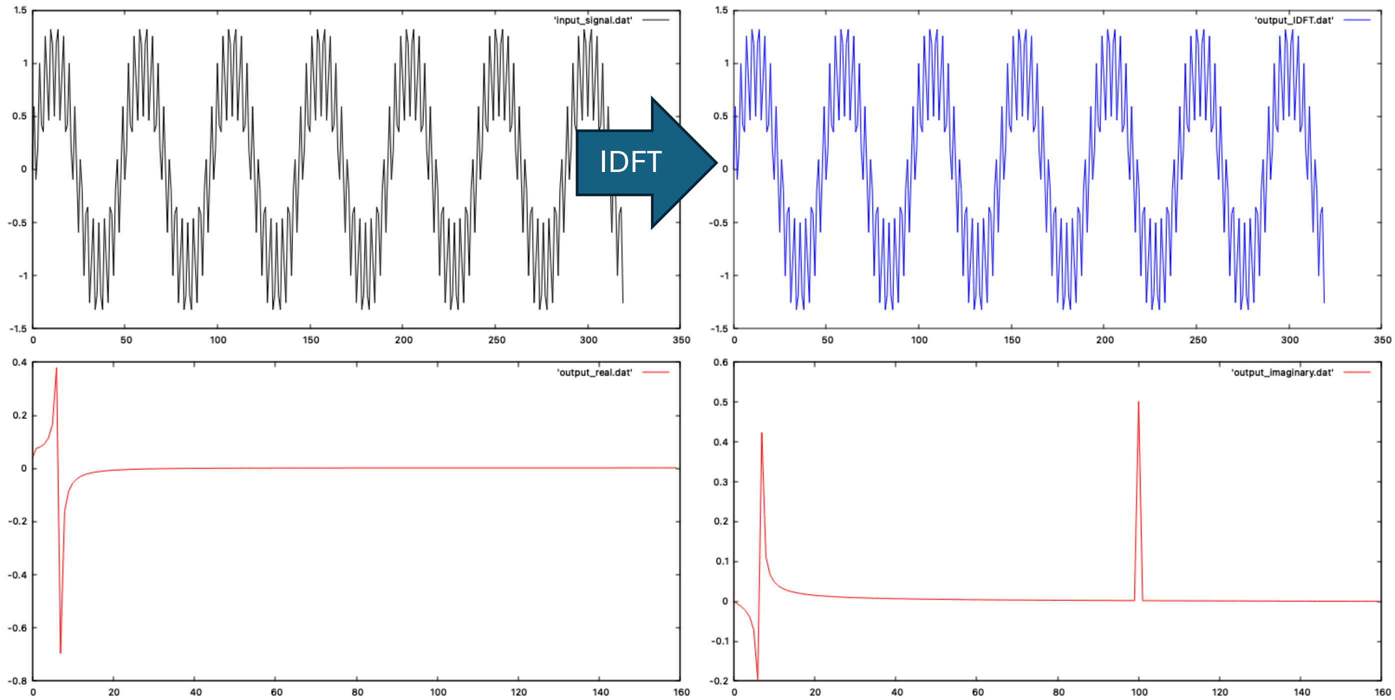
Code Plot



The IDFT Plot can be seen on the top right(blue). The signal matches the original.