

## 8A Quiz 2

Q1. If a Gaussian function in the time domain has a narrow width, how does this affect the width of its Fourier transform in the frequency domain, and why?

**Answer:**

The relationship between the width of a Gaussian function and the width of its Fourier transform is an inverse one. If a Gaussian function is narrow in the time domain, its Fourier transform will be wide in the frequency domain.

**Why:** A narrow Gaussian in the time domain indicates that the signal is changing rapidly, requiring a wide range of frequencies to accurately represent it.

## 8A Quiz 2

Q2. In image compression, how might the DFT be used to reduce the amount of data needed to represent an image?

**Answer:**

The DFT (or more commonly, the Discrete Cosine Transform, DCT, which is closely related) is used in image compression techniques like JPEG. Many of the DFT coefficients in an image tend to be small or close to zero. By quantizing (reducing the precision of) or discarding these small coefficients, the amount of data needed to represent the image can be significantly reduced, resulting in compression. The inverse DFT is then used to reconstruct the image from the remaining coefficients