Solutions to EE3210 Quiz 9 Problems

Problem 1: Using the time shift property of the continuous-time Fourier transform, we have

$$x(t+1) \leftrightarrow e^{j\omega} X(\omega).$$

Then:

- Using the time reversal property, we have

$$x(1-t) \leftrightarrow e^{-j\omega} X(-\omega).$$

- Using the time scaling property, we have

$$x(1-2t) \leftrightarrow \frac{1}{2} e^{-j\omega/2} X\left(-\frac{\omega}{2}\right).$$

Therefore, using the convolution property, we obtain

$$Y(\omega) = \frac{1}{2} e^{-j3\omega/2} X(-\omega) X\left(-\frac{\omega}{2}\right).$$

Problem 2: Using the time shift property of the discrete-time Fourier transform, we have

$$x[n-k] \leftrightarrow e^{-j\Omega k} X[\Omega].$$

Then, using the linearity property, we obtain

$$Y[\Omega] = \sum_{k=0}^{+\infty} e^{-j\Omega k} X[\Omega] = \frac{1}{1-e^{-j\Omega}} X[\Omega].$$