Concept Question 12-6: Explain the similarities and differences between the time-shift and frequency-shift properties of the Laplace transform.

$$f(t-T)\,u(t-T) \quad \leftrightarrow \quad e^{-T\mathbf{s}}\,\mathbf{F}(\mathbf{s}), \qquad T \geq 0.$$

(time-shift property)

$$e^{-at}\,f(t) \quad \leftrightarrow \quad \mathbf{F}(\mathbf{s}+a).$$

(frequency shift property)

The two properties are symmetrical: shifting in the time domain results in multiplication by an exponential in the **s** domain, and shifting in the **s** domain results in multiplication by an exponential in the time domain.