

Concept Question 3-4: According to the time scaling property of the Laplace transform, “shrinking the time axis corresponds to stretching the s-domain.” What does that mean?

The Laplace transform of $x(at)$ is $\mathbf{X}(s/a)$. Multiplication of t by a shrinks $x(t)$, Division of s by a expands $\mathbf{X}(s)$.

$$x(at) \longleftrightarrow \frac{1}{a} \mathbf{X}\left(\frac{s}{a}\right), \quad a > 0. \quad (3.12)$$

(time-scaling property)