

Concept Question 12-5: According to the time scaling property of the Laplace transform, “stretching the time axis corresponds to shrinking the s axis.” What does that mean?

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

(time-scaling property)

It means that if a certain function $f(t)$ has a corresponding Laplace transform $\mathbf{F}(s)$, then if we stretch t to at to obtain $f(at)$, the Laplace transform corresponding to $f(at)$ is $(1/a) \mathbf{F}(s')$, where s' is a scaled version of s , namely $s' = s/a$. Hence stretching the time axis t results in shrinking of the s axis, and vice versa.