

EX: Find  $\lim_{t \rightarrow 0} v(t)$  if  $V(s) = \frac{(3s^2 + 12)(s - 4)}{[(s + 2)^2 + 5^2](s^2 + 5s + 6)}$ .

SOL'N:

We use the Initial Value Theorem:

$$\begin{aligned}\lim_{t \rightarrow 0} v(t) &= \lim_{s \rightarrow \infty} sV(s) \\ &= \lim_{s \rightarrow \infty} \frac{s(3s^2 + 12)(s - 4)}{[(s + 2)^2 + 5^2](s^2 + 5s + 6)}\end{aligned}$$

We may ignore additive terms if there is a term with a higher power of  $s$ , since  $s^2 \gg s$ , for example, as  $s \rightarrow \infty$ .

$$\lim_{t \rightarrow 0} v(t) = \lim_{s \rightarrow \infty} \frac{\cancel{s}(3s^2)\cancel{s}}{s^2 \cdot \cancel{s^2}} = \frac{3}{1} = 3$$

Thus,  $\lim_{t \rightarrow 0} v(t) = 3$