

Prob. 4.8

Engineering stress $G=E/3$ for rubber

:

$$\sigma_e := G * (\lambda - (1/\lambda^2));$$

$$\sigma_e := G \left(\lambda - \frac{1}{\lambda^2} \right)$$

True stress:

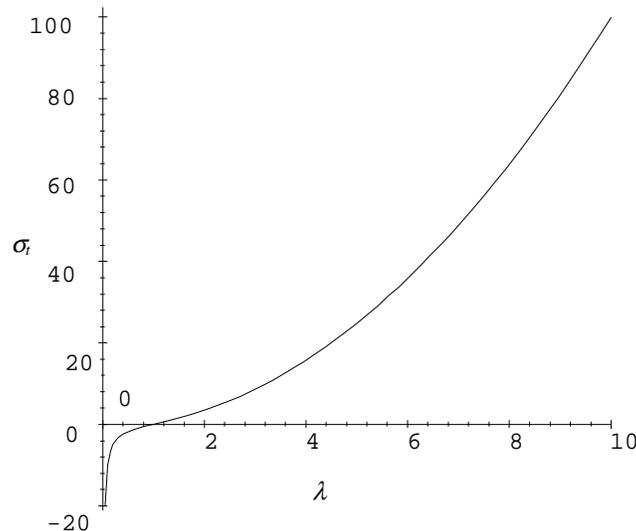
$$\sigma_t := \sigma_e * \lambda;$$

$$\sigma_t := G \left(\lambda - \frac{1}{\lambda^2} \right) \lambda$$

(1)

Set $G=1$ and plot to investigate the nature of this function:

$$G:=1; \text{plot}(\sigma_t, \lambda=0..10);$$



This function has no tangents, and thus will not form a neck.

We can also examine the Considere condition mathematically, which states that necking occurs when

$$\frac{\sigma_t}{\lambda} \geq \frac{d\sigma_t}{d\lambda}$$

Using Eq (1) above for σ_t , this gives

$$\lambda + \frac{2}{\lambda^2} \leq 0$$

But for λ positive this never occurs, so necking cannot occur either.