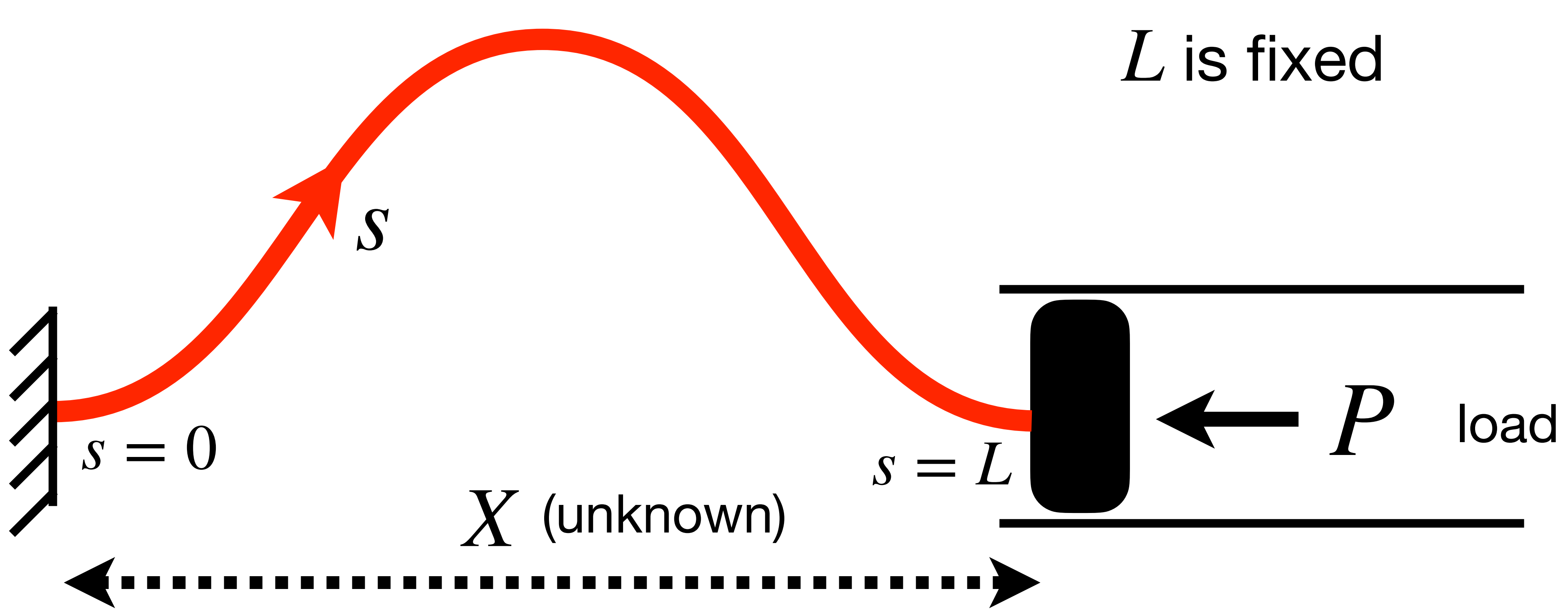
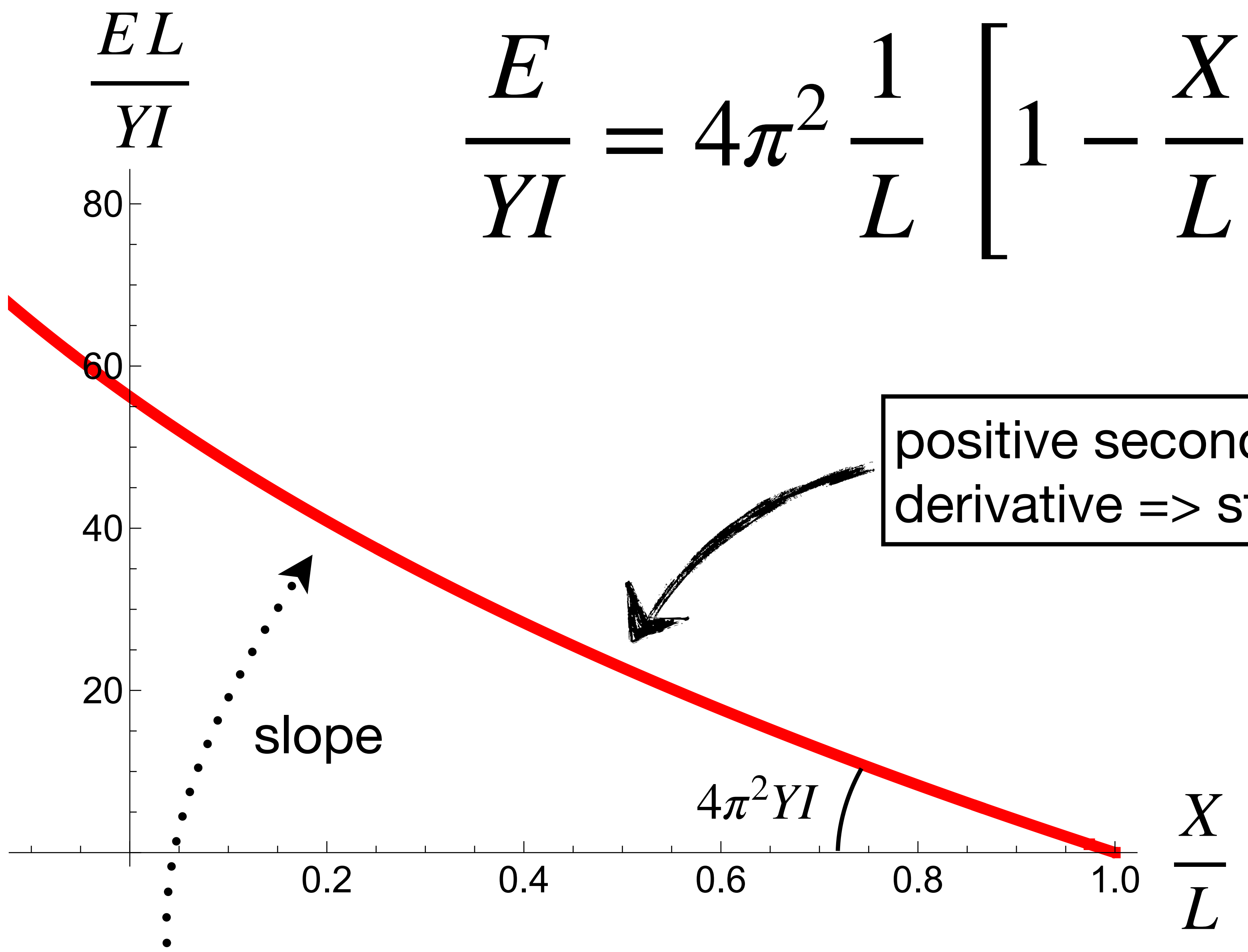
Euler 1744

Planar Elastica



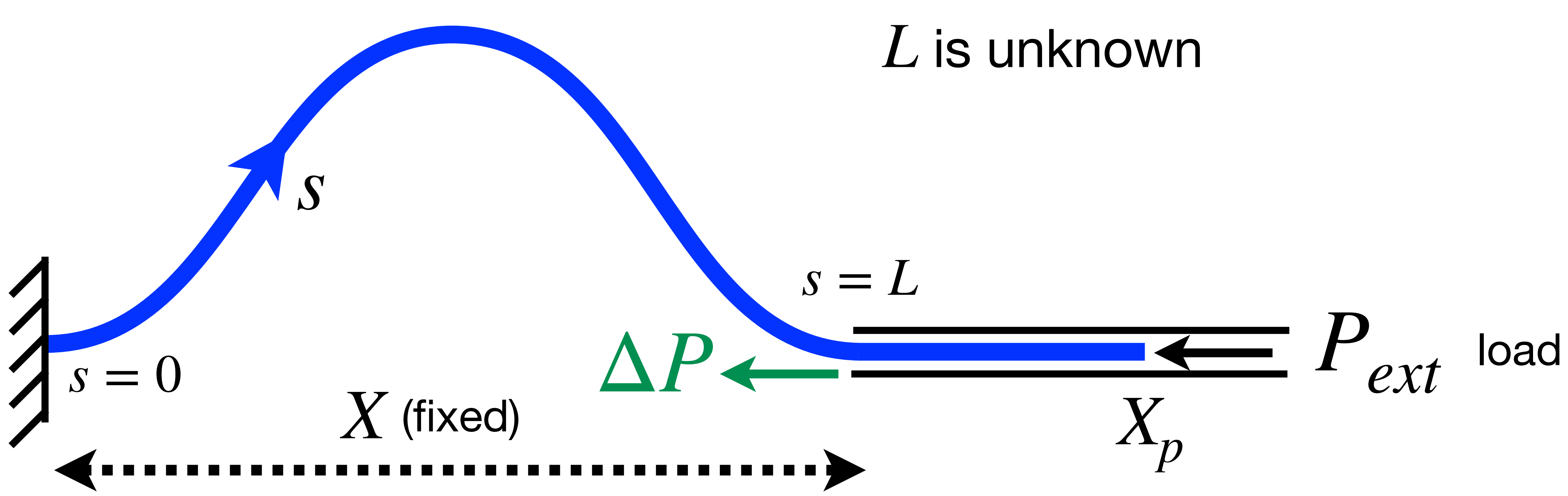


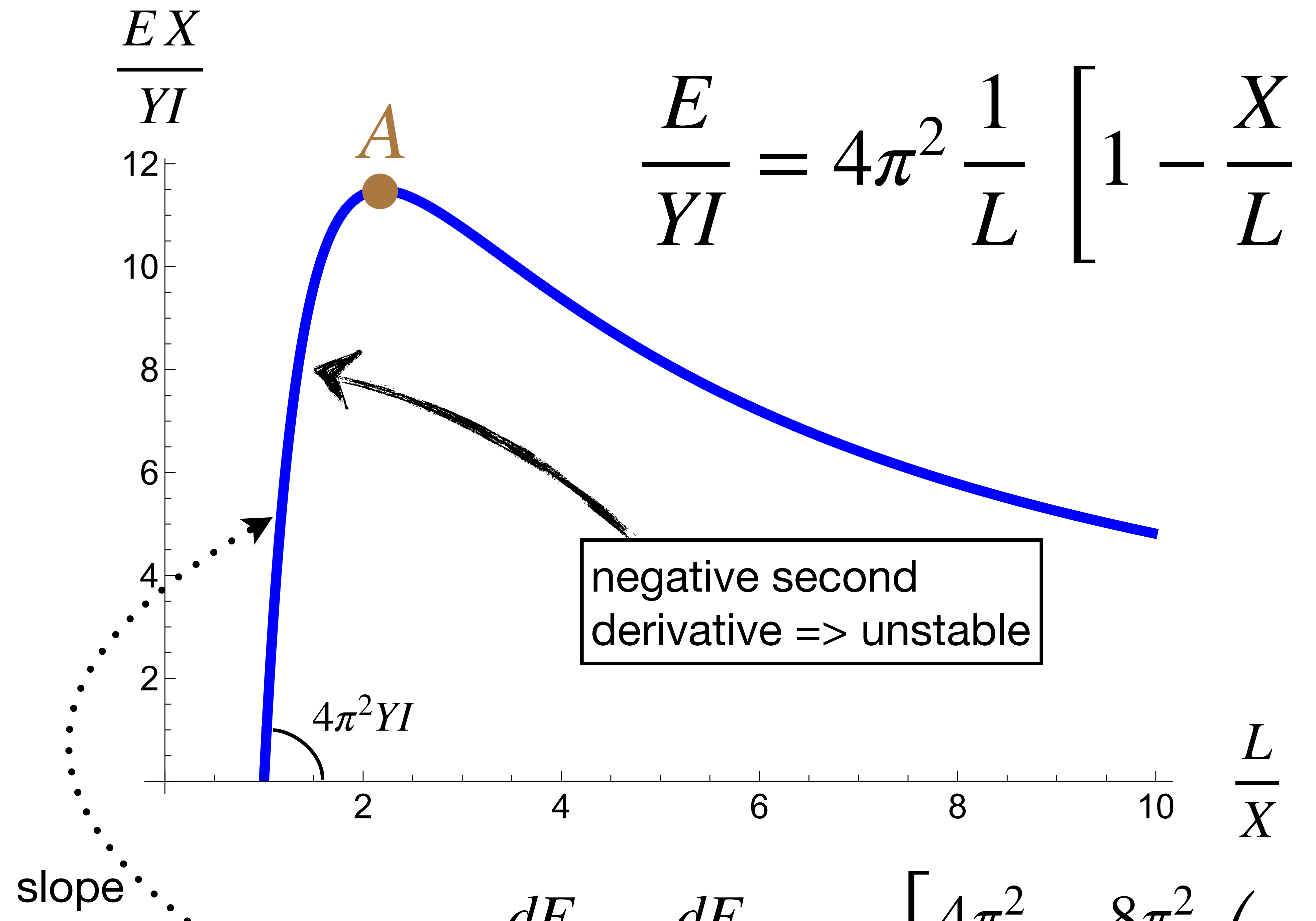
$$\frac{E}{YI} = 4\pi^2 \frac{1}{L}\left[1 - \frac{X}{L} + \ldots\right]$$

$$P = -\frac{dE}{dX} = YI\left[\frac{4\pi^2}{L^2} + \ldots\right]$$

The (mysterious) sliding sleeve

Bosi (2014) PhD





$$\frac{E}{YI} = 4\pi^2 \frac{1}{L}\left[1 - \frac{X}{L} + \ldots\right]$$

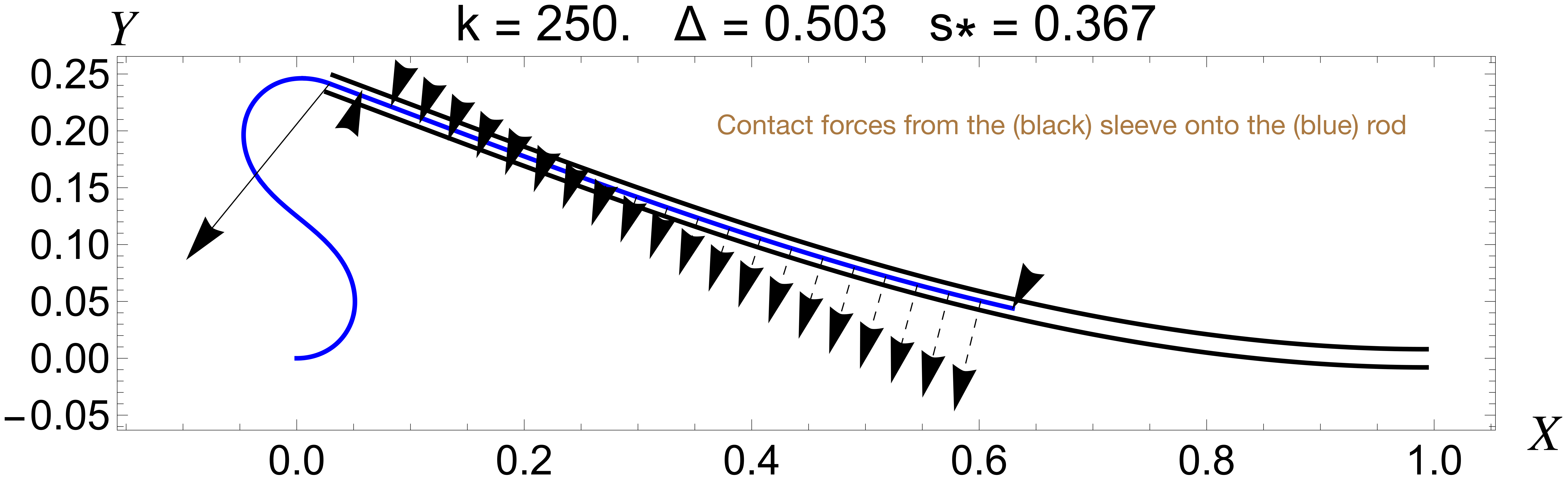
$$P_{ext} = -\frac{dE}{dX_p} = \frac{dE}{dL} = YI\left[\frac{4\pi^2}{L^2} - \underbrace{\frac{8\pi^2}{L^2}\left(1 - \frac{X}{L}\right)}_{\Delta P} + \ldots\right]$$

NB: At point A, the applied force is zero!

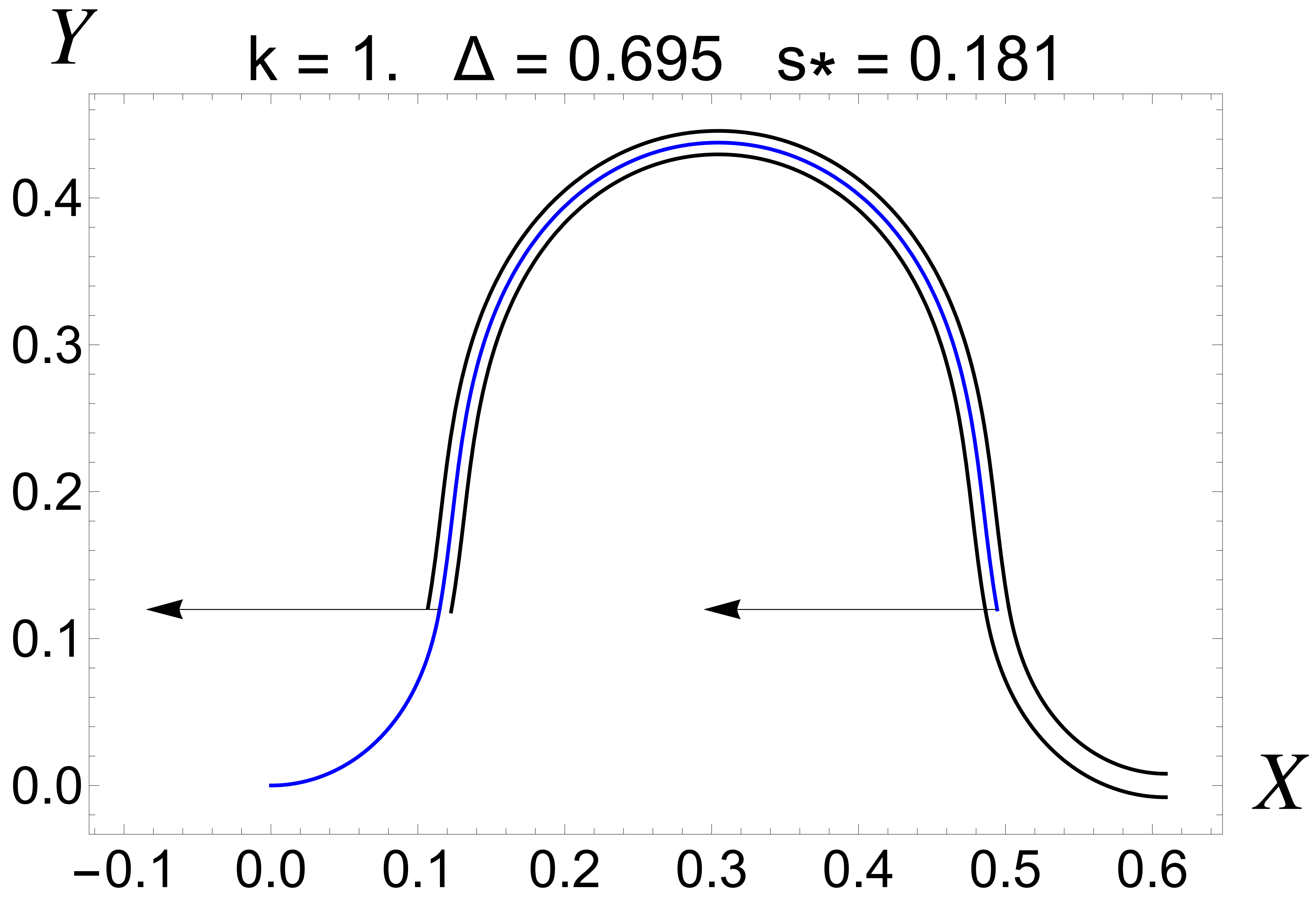
The flexible sliding sleeve

Neukirch, Dal Corso, Vetyukov 2024

Blue is 250 times more flexible than black



Blue and black have same flexibility



No contact forces along the sleeve (!)
Only point forces at entry/exit points (!)