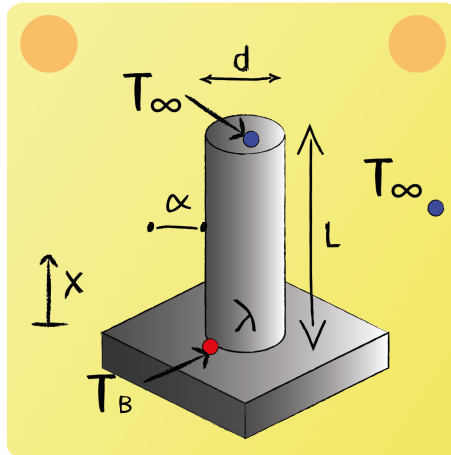


Fins - Flux 3

Calculate the transferred heat flow for the given fin with the head temperature equal to the ambient temperature.



Possible solution for θ :

$$\theta(x) = A \cdot \cosh(mx) + B \cdot \sinh(mx)$$

And thus

$$\theta(0) = A = \theta_B$$

$$\theta(L) = A \cdot \cosh(mL) + B \cdot \sinh(mL) = 0$$

$$\Rightarrow B = \frac{-\theta_B \cdot \cosh(mL)}{\sinh(mL)} = \frac{-\theta_B}{\tanh(mL)}$$

Energy balance around the fin (base to tip):

$$\dot{Q}_{\text{cond,base}} - \dot{Q}_{\text{conv}} = 0$$

Thus

$$\dot{Q}_{\text{cond,base}} = -\lambda \cdot A_c \cdot \left. \frac{d\theta}{dx} \right|_x = 0$$

$$\left. \frac{d\theta}{dx} \right|_x = 0 = B \cdot m$$

Results in:

$$\dot{Q}_{\text{conv}} = \lambda \cdot \frac{\pi \cdot d^2}{4} \cdot \frac{\theta_B \cdot m}{\tanh(mL)}$$