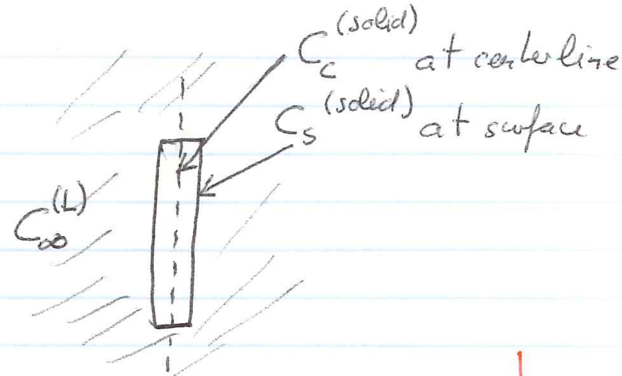
Recap:



Series Resistance:

$$\frac{\overbrace{C_c^{(solid)} - C_s^{(solid)}}^{\text{driving force in solid}}}{\underbrace{C_s^{(solid)} - K\,C_\infty^{(L)}}_{\text{convective driving force}}} \sim \frac{k_c L}{K D} = Bi$$

Eq. 3.4-4 $\qquad K$ ... equil. partition coeff.

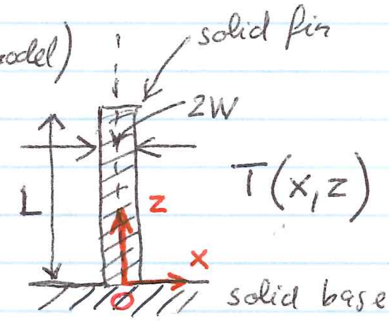
Translated to Heat Transfer

$$\frac{T_c^{(solid)} - T_s^{(solid)}}{T_s^{(solid)} - T_\infty^{(L)}} = Bi$$

note: without contact resistance $T_s^{(solid)} = T_s^{(L)}$

for $Bi \ll 1$: $T^{solid} \approx$ const. (lumped model)

Extension from 1D to 2D



$0 \le x \le W$ along width

$0 \le z \le L$ along length

for small Biot number and W narrow one can estimate: $Bi_x \ll 1 \Rightarrow T(x) \approx$ const

$$\Rightarrow T(x,z) \Rightarrow T(z) \text{ only}$$

Analytically, this is accomplished with the fin approximation:

$$\bar{T}(z) \equiv \frac{1}{W}\int_0^W T(x,z)\,dx \qquad \text{Eq. 3.4-14}$$