WAYS TO INCREASE

$$\dot{Q}_{conv} = hA(T_s - T_\infty)$$

1) INCREASE ______________

+ —

•

•

•

2) INCREASE ______________

+ —

•

•

•

3) INCREASE ______________

+ —

•

•

•

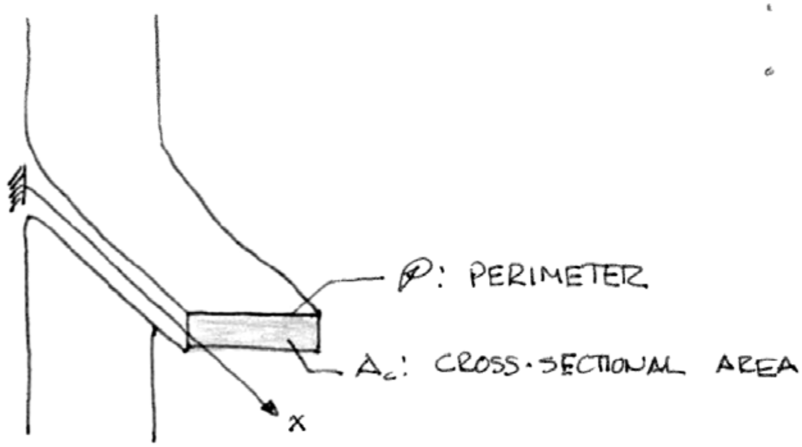
FINS

MODEL A FIN TO GET

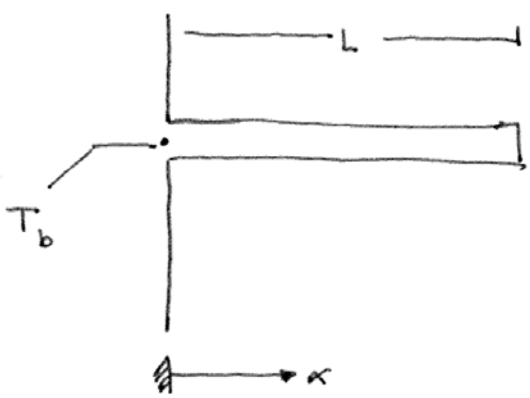
- $T = T(x)$ &
- $\dot{Q}_{FIN} = ?$

ASSUME:

- 1-D CONDUCTION
-
-
-



SIDE VIEW:



*Thermal Energy Balance:**

$$\frac{dU}{dt} =$$

* why not use the conduction equation?

NOTES: Fins

$$\frac{d\dot{Q}}{dx} + hP(T_x - T_\infty) = 0$$

WHAT'S $\dot{Q} = ?$

$= -$ ___

$-$ ___ $+ hP(T_x - T_\infty) = 0$

LET: $\theta \equiv T_x - T_\infty$

___ $-$ ___ $= 0$

FIN EQN (CONST X-SEC AREA)

SOLVE IT! CHR. EQN IS

SO:

WHAT ARE THE BCs?

	IN T	IN $\theta = (T - T_\infty)$
BC#1	X = 0	X = 0
BC#2	X = L	

CHOICES

1)

2)

3)

NOTES: Fins

1) INFINITELY LONG FIN

$T(x=L) =$ $\qquad$ $\theta(x=L) =$ $\qquad$ AS $L \to \infty$

SO: (BC #2)

$\theta(x = L \to \infty) =$

$\therefore C_1 =$ ______

BC # 1:

$\theta(x=0) =$

$\therefore C_2 =$ ______

$$\theta = \theta_b e^{-ax} = (T_b - T_\infty)\exp\left[-\sqrt{\frac{hP}{kA_c}}\,x\right]$$

$$\frac{T(x) - T_\infty}{T_b - T_\infty} = e^{-\sqrt{\frac{hP}{kA_c}}\,x}$$

- INFINITELY LONG FIN
- CONST A_c

2) INSULATED TIP

BC # 2

$-$ ______ $=$

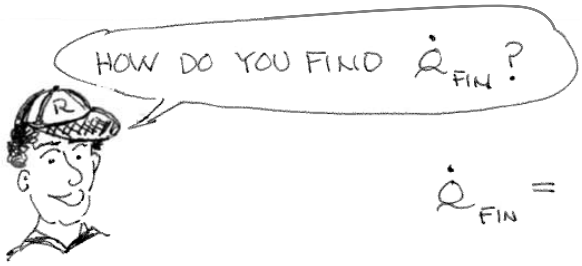
$$\frac{T_x - T_\infty}{T_b - T_\infty} = \text{______}$$

3) CONVECTIVE TIP

APPROXIMATION

$$L_c \triangleq L + \text{___}$$

NOTES: Fins



$$\dot{Q}_{FIN} = \quad \overline{\quad\quad} \Big|_{x=}$$

COLY LONG ⟹ $\dot{Q} = \sqrt{\quad\quad\quad}\ (\quad\quad)$

INSUL. TIP ⟹ $\dot{Q} = \sqrt{\quad\quad\quad}\ (\quad\quad)$

¿WHAT'S THE BIGGEST $\dot{Q}_{FIN}$ YOU CAN IMAGINE?

$$\dot{Q}_{MAX} = \quad \uparrow \underline{\quad\quad\quad\quad\quad\quad} \neq$$

FIN EFFICIENCY

$$\eta_f \equiv \frac{\quad}{\quad}$$

COLY LONG:

$$\eta_f = \frac{\quad}{\quad}$$

$$\eta_{f,\infty} = \frac{\quad}{\quad}\sqrt{\quad\quad\quad}$$

$$\eta_{f,INS} = \frac{\quad}{\quad}$$

OTHER GEOMETRIES VIA CHARTS IN YOUR TEXT OR OTHERS.