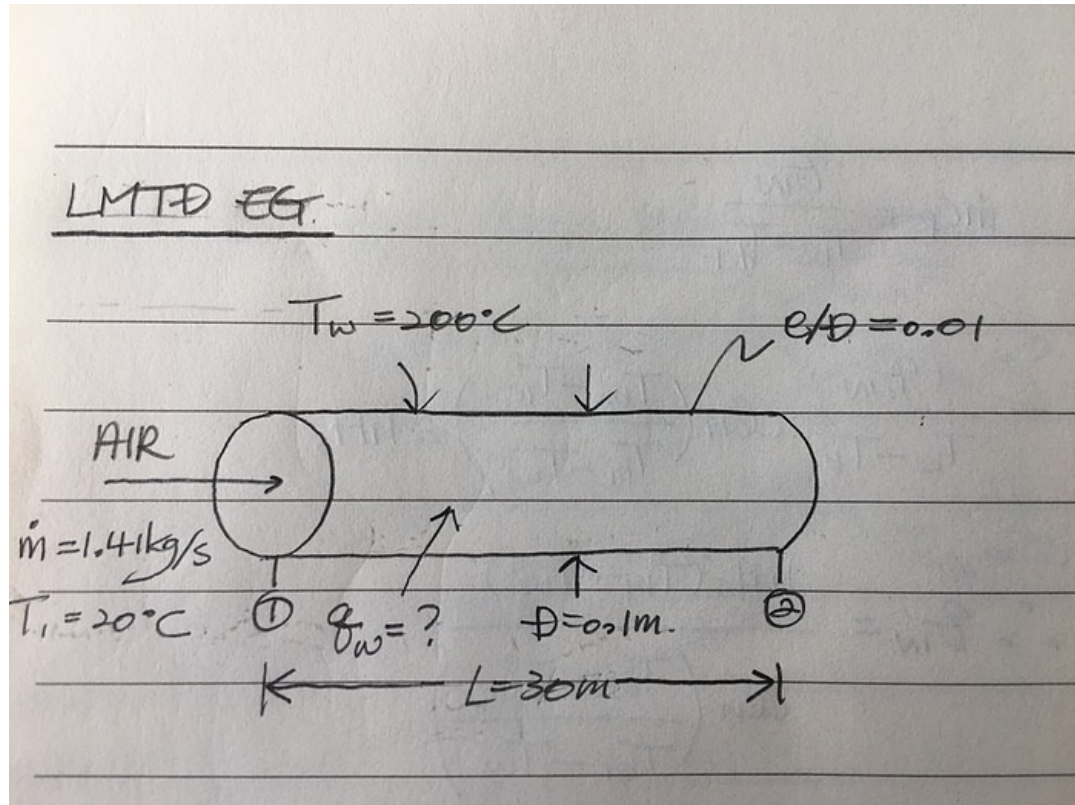# Heat Transfer Questions & Answers

Question by Student 201127151

Professor, I have a question about the log mean temperature difference. You explained the LMTD EG :

And Solving the example, you used the following equations :

$$q_w = \frac{hA_s(T_{b1} - T_{b2})}{\ln(\frac{T_w - T_{b2}}{T_w - T_{b1}})} \tag{1}$$

and

$$q_{in} = \dot{m}c_p(T_{b2} - T_{b1}). \tag{2}$$

When heat is transferred to the pipe, I think that the equation (1) and (2) have positive values. If so, I think that the equation (1) is directly equal to the equation (2). But you used a negative sign as follow :

$$\dot{m}c_p(T_{b2} - T_{b1}) = -\frac{hA_s(T_{b1} - T_{b2})}{\ln(\frac{T_w - T_{b2}}{T_w - T_{b1}})}$$

Which one is correct?

Yes, $q_w = q_{in}$. The following is wrong:

$$\dot{m}c_p(T_{b2} - T_{b1}) = -\frac{hA_s(T_{b1} - T_{b2})}{\ln(\frac{T_w - T_{b2}}{T_w - T_{b1}})}$$

I guess I meant:

$$\dot{m}c_p(T_{b2} - T_{b1}) = -\frac{hA_s(T_{b2} - T_{b1})}{\ln(\frac{T_w - T_{b2}}{T_w - T_{b1}})}$$

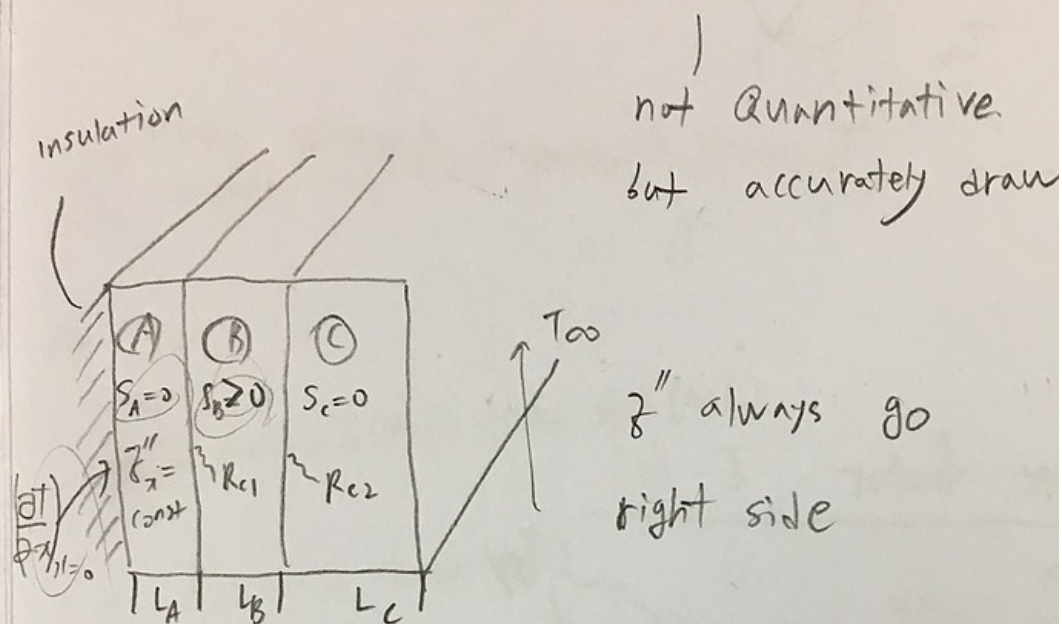Change the sign if necessary. 2 points bonus.

Question by Student 201227127

professor, I don't understand question 4 of Assignment 8. there is a phrase 'to appose negligible resistance to heat flow.' what does it mean? I think that this means there is no contact conductance. Is it right?

This means the heat resistance of the pipe material itself is small.. Not that there is no contact conductance. 1 point bonus.
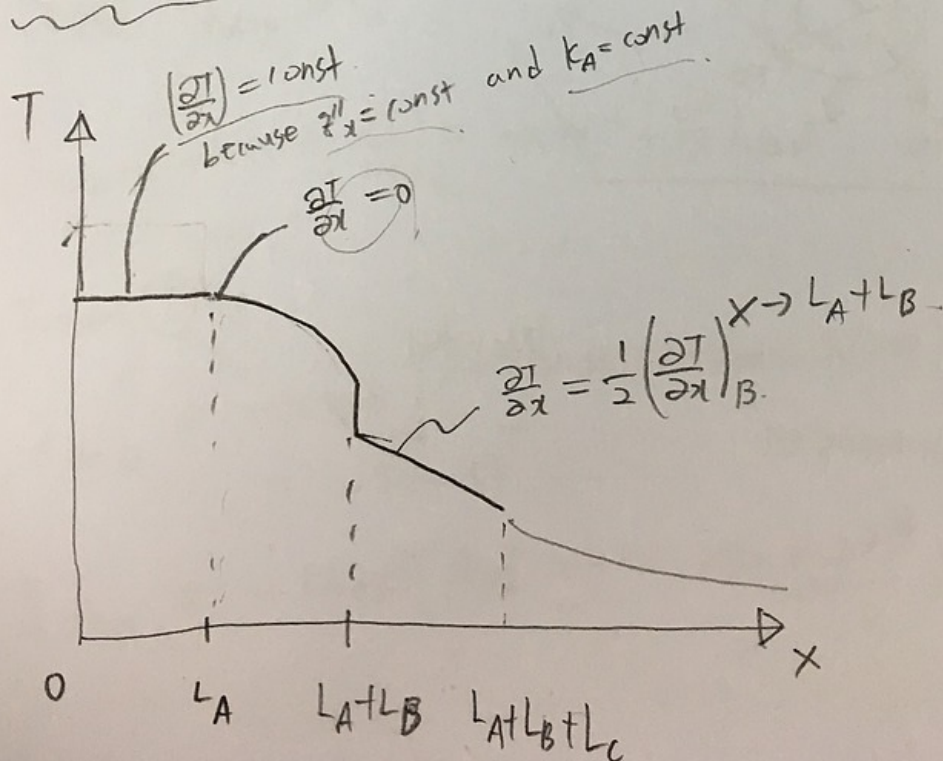
Question by Student 201427132

Temperature profile "sketch"

not Quantitative
but accurately draw

insulation

T_∞

$\vec{q}''$ always go right side

$\textcircled{A}$ $\textcircled{B}$ $\textcircled{C}$

$S_A = 0$ $S_B \geq 0$ $S_C = 0$

$\vec{q}''_x = $ const R_{c1} R_{c2}

$\left.\frac{\partial T}{\partial x}\right|_1 = 0$

L_A L_B L_C

$K_B = 2 K_A$

$K_C = 2 K_B$

T vs x ?

T

$\left(\frac{\partial T}{\partial x}\right) = $ const
because $\vec{q}''_x = $ const and $k_A = $ const.

$\frac{\partial T}{\partial x} = 0$

$x \to L_A + L_B$

$\frac{\partial T}{\partial x} = \frac{1}{2}\left(\frac{\partial T}{\partial x}\right)_B$

0 L_A $L_A + L_B$ $L_A + L_B + L_C$ x

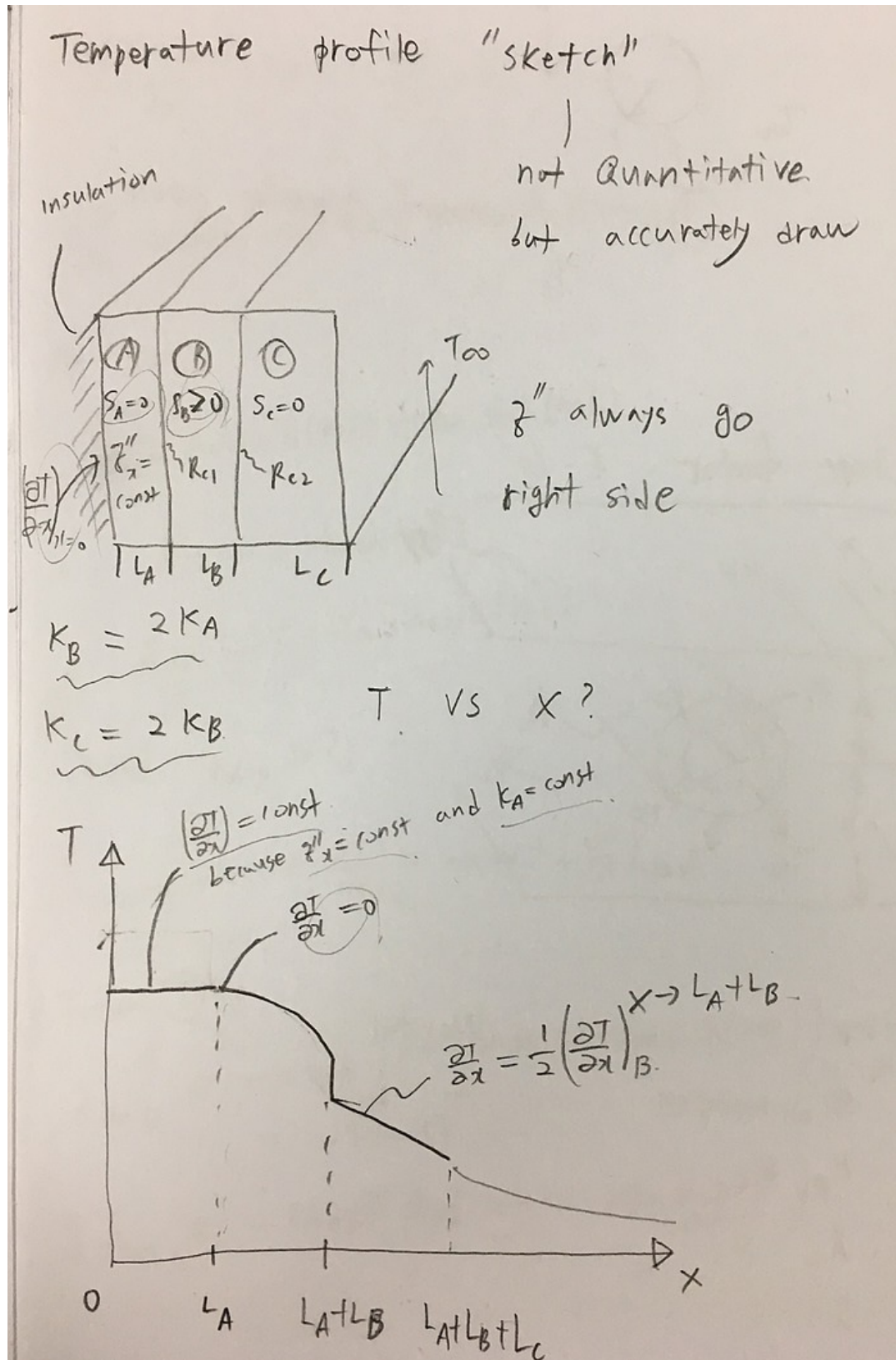Dear professor, I have question on "Temperature profile sketch".
I am curious that why $\frac{dT}{dx}$ on graph is decreasing between section L_A and section $L_A + L_B$ although there is heat generation between section L_A and section $L_A + L_B$.
I guess if there is heat generation, temperature goes up.
But in the graph, it doesn't. Why this happened?

If the temperature would go up, where would the heat go? Left or right?

Question by Student 201427132

Temperature profile "sketch"

)

not Quantitative.

but accurately draw

insulation

$S_A = 0$ $S_B > 0$ $S_C = 0$

$\ddot{q}''_x = $ const

$\frac{\partial T}{\partial x}\Big|_{l} = 0$

R_{c1} R_{c2}

L_A L_B L_C

T_∞

$\ddot{q}''$ always go right side

$K_B = 2 K_A$

$K_C = 2 K_B$

T vs X ?

$\left(\frac{\partial T}{\partial x}\right) = $ const.

because $\ddot{q}''_x = $ const and $k_A = $ const

$\frac{\partial T}{\partial x} = 0$

$\frac{\partial T}{\partial x} = \frac{1}{2}\left(\frac{\partial T}{\partial x}\right)_B$ $x \to L_A + L_B$

0   L_A $L_A + L_B$ $L_A + L_B + L_C$

I rewrite my previous question about "Temperature profile sketch".

I am curious that why $\frac{dT}{dx}$ on graph is decreasing between section L_A and section $L_A + L_B$ although there is heat generation between section L_A and section $L_A +$

L_B.

I guess if there is heat generation, temperature goes up.
But in the graph, it doesn't. Why this happened?

There is one assumption that heat always go to right side.

Well yes, but I think the answer to this is fairly obvious.. So, I am asking you to think about it a little. You ask why temperature goes down and not up. But if the temperature goes up, where will the heat go? Answer left or right.

Question by Student 201427132

Dear professor, I have some question about (c) of Question#1, Assignment 5
I assumed flow in between the plates as couette flow ,and derive temperature distribution of fluid from energy equation. :
$T = T_{bot} + \frac{\mu u_{top}^2 y}{Hk}$ (1-$\frac{y}{2H}$) where H is gap width of two plates, U_{top} as velocity of upper plate, and T_{bot} is temperature of lower plate.
Since, T is as form of 2nd order equation ,so I guess that the $y=y_{max}$ where $\frac{dT}{dy}$ is zero is the point that maximum temperature exist.
To get y_{max} I derived $\frac{dT}{dy}$: $\frac{\mu u_{top}^2}{Hk}$ (1- $\frac{y}{H}$).
In this equation, $y_{max} =H$. But, correct answer is $y=\frac{H}{2}$
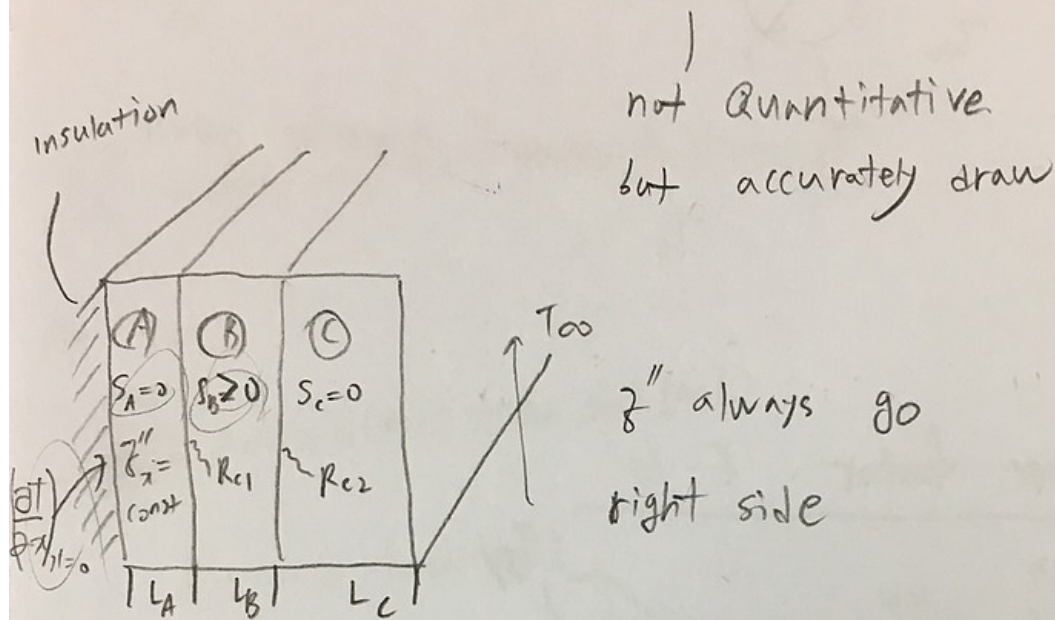*I can not understand where i made mistake. I think that this approach does not have an error.*

What boundary conditions did you use to derive this equation for T?

Question by Student 201427132

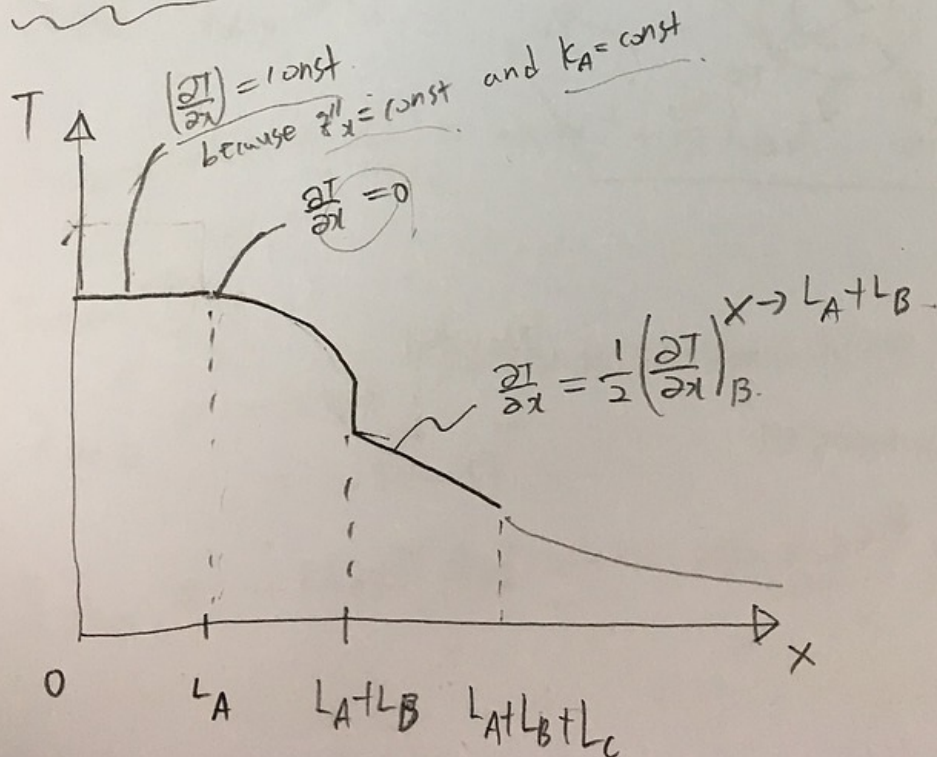*Dear professor, i ask you that i understand in right way.*
Previous question :

Temperature profile "sketch"

)
not Quantitative.
but accurately draw

insulation

T_∞

$\vec{z}''$ always go right side

A B C

$S_A = 0$ $S_B > 0$ $S_C = 0$

$\vec{z}''_x = R_{c1}$ R_{c2}

const

$\left.\frac{\partial T}{\partial x}\right|_{x=0} = 0$

L_A L_B L_C

$K_B = 2K_A$

$K_C = 2K_B$

T vs X?

$\left(\frac{\partial T}{\partial x}\right) = const$
because $\vec{z}''_x = const$ and $k_A = const$

$\frac{\partial T}{\partial x} = 0$

T

$\frac{\partial T}{\partial x} = \frac{1}{2}\left(\frac{\partial T}{\partial x}\right)_B$ $x \to L_A + L_B$

0 L_A $L_A + L_B$ $L_A + L_B + L_C$

I rewrite my previous question about "Temperature profile sketch".
I am curious that why $\frac{dT}{dx}$ on graph is decreasing between section L_A and section $L_A + L_B$ although there is heat generation between section L_A and section $L_A + L_B$.

I guess if there is heat generation, temperature goes up. But in the graph, it doesn't. Why this happened?

There is one assumption that heat always go to right side.
06.15.17
Well yes, but I think the answer to this is fairly obvious.. So, I am asking you to think about it a little. You ask why temperature goes down and not up. But if the temperature goes up, where will the heat go? Answer left or right.

I understand temperature should go down, the reason that if temperature goes up, heat would go left side, and it results temperature goes up in section L_A, So it does not make sense.
As a result, temperature should go down.
Am i understand in right way?

Yes that's fine! You answered your own question.. I can give you 0.5 point bonus boost.