Heat Transfer Questions & Answers

Question by Student 201427111

Professor, I have a question about emissivity in class. Emissivity means $\frac{emitted-heat-flux}{heat-flux-emitted-if-black} = \frac{q_G rayout}{\sigma T_G^4 A}$*. I think that heat flux emitted if black is* $\sigma T_B A$*. therefore i don't know why heat flux emiited if black is* $\sigma T_G A$*. Is that same* $\sigma T_B A = \sigma T_G A$*?*

Well no, the heat flux emitted if black is σT_G^4 because T_G is the temperature of the matter. It doesn't matter if the matter is black or gray. 0.5 point bonus.

Question by Student 201327106

Professor, I have a weird question. When I add temperatures, one of them is degree Celsius and another is Kelvin, there are two answers.Firstly,

$0'C + 273K = 0'C + (273 - 273)'C = 0'C$

Secondly,

$0'C + 273K = (0 + 273K) + 273K = 546K = 273'C$

I'm so confused and I do not know which of them is correct. Thank you.

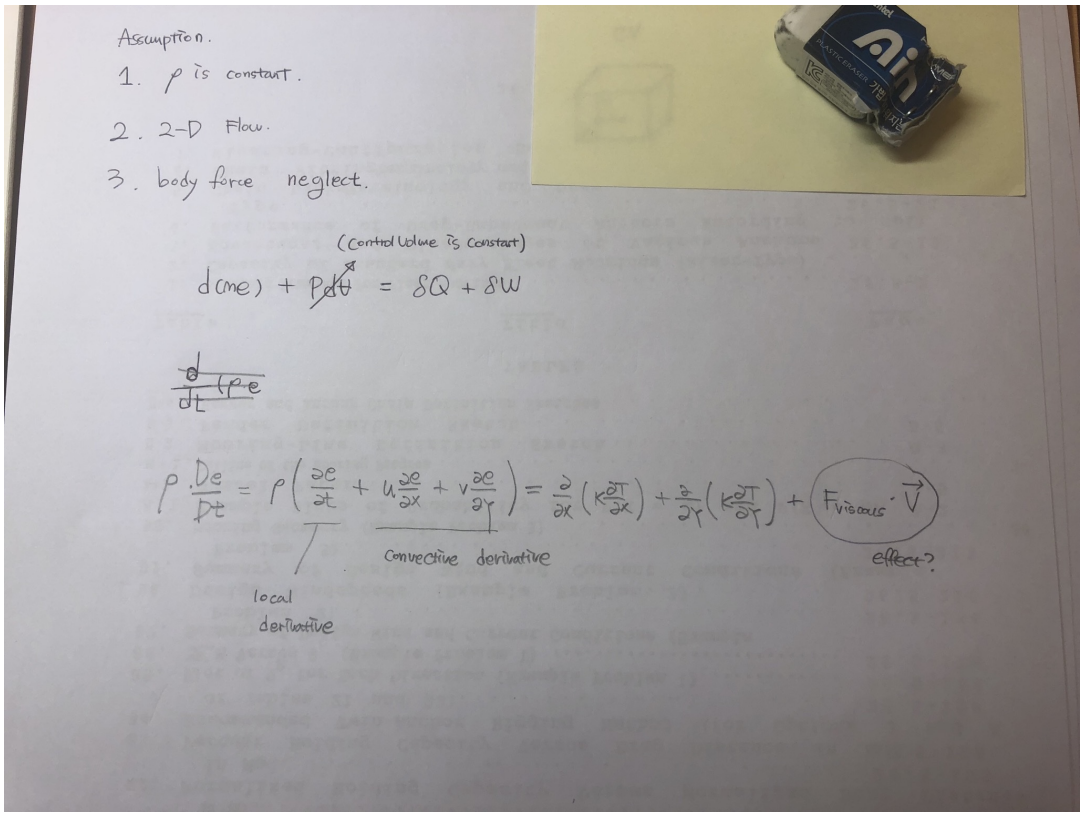
The difference between degrees Celcius is equal to the difference between Kelvin degrees. But not the sum! The sum of 2 temperatures doesn't make sense in heat transfer. Interesting point. 1 point bonus.

Question by Student 201427103

Professor, I would like to ask you something I have questions about while studying for the midterm exam.

During the Heat Equation proof process, we assumed that objects were stationary within a given space. But I started to question what would happen if it wasn't stationary.

My personal thoughts are shown in the attached picture.



Do you think there is a mistake? I would also like to ask how the viscous effects should be defined. Thank you.

This is beyond the material you have to cover for the midterm exam. We'll see this in the second half of the course. 0.5 point bonus boost.

Question by Student 201427152

Dear Professor,

I have a question about the usage of Heat Equations.
We already studied 2 Types of Heat Equation. (i.e. Derivation form and Integration form)

But, when I used Heat Equation for solve assignments,
I has been confused which one is proper to solve problem.

What is the difference in Derivation form and Integration from?

Well, I think Integration form is more proper to solve problem.
because the term

$$\int_s \overrightarrow{q''} \cdot ndS$$

can express almost all types of heat transfer.

Is it okay to have this idea?

Thank you for reading.

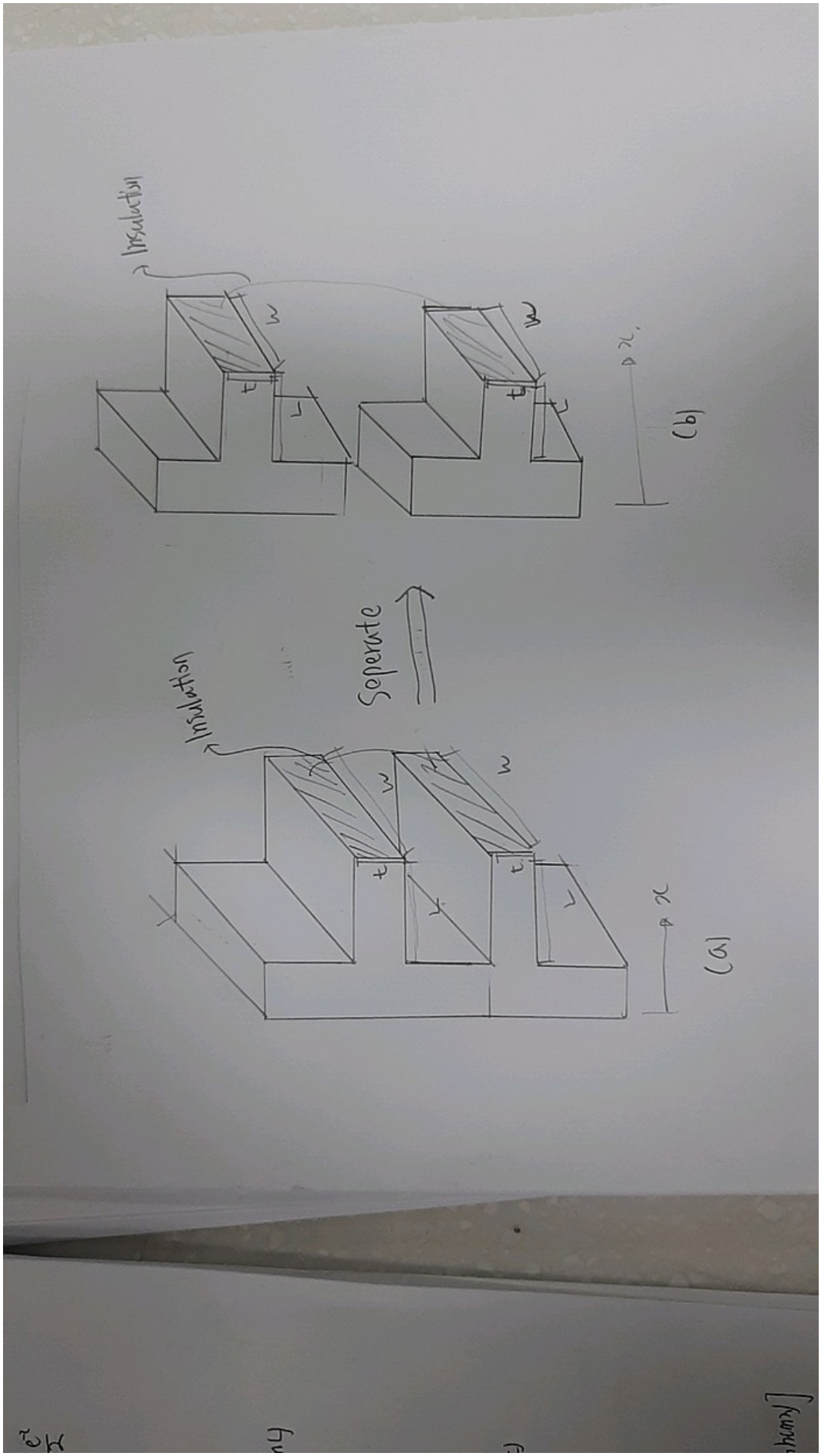
Both equations reflect the exact same physics and assumptions but they are expressed differently. We didn't derive the integral form, we simply obtained it from the differential form. Also, avoid breaking lines for every sentence. In English, you should only break a line between paragraphs, with each paragraph expressing an idea. Because one question is one idea, it should be expressed within one paragraph.

Question by Student 201427106

Professor, I have a question about shape of fin.
If the fin shape is like a picture (a) which has double rectangular fin, Can I analize it two fins of single rectangular fins like picture (b) that heat flow is

$2q_{single fin} = q_{double fin}$

If the analysis is wrong, how can I find the heat flow?



Yes, consider those as two independent fins and sum up the heat transfer.

Question by Student 201627118

Dear Professor, for Assignment # 3, Question # 1, I would like to use the chart for Efficiencies of Circumferential Fins. Therefore, in order to find Fin Efficiency, I need to find the following value:

$$L_c{}^{\frac{3}{2}} \left(\frac{h}{kA_m}\right)^{\frac{1}{2}}$$

I checked the Table for Property Values for Metals to obtain the thermal conductivity (k) for Aluminum, which is not given in the problem. However, on that table, there are different values for k depending on the temperature. In this case, which value should I use for k?

Well choose a value that will be reasonable in this case. Either the base temperature of the fin, or the average between the fin base temperature and the fluid temperature far from the fin. 0.5 point bonus.