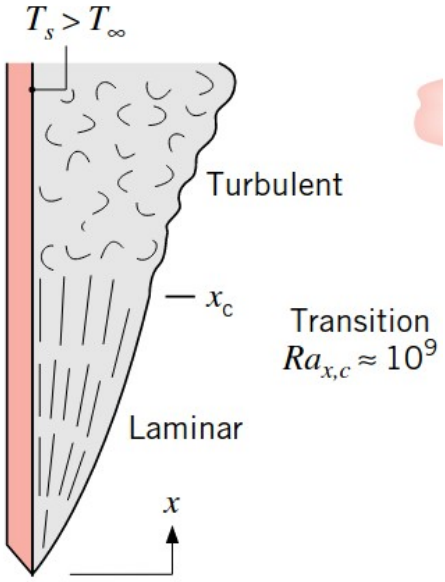
HW5, PP1



A wood burning stove is in a corner of a room. The heat transfer surface area is rectangular, where the height is H and width is w (given in the assignment)

First, we calculate Rayleigh number to determine which Nusselt number correlation to use

$$Ra = g\beta(T_s - T_{inf})H^3/\nu\alpha$$

For ideal gas $\beta = 1/T$ Important! T is here in Kelvins!

When you have calculated the Nusselt number, the heat transfer coefficient is calculated from the definition of the Nusselt number

$$Nu = hH/k$$

Here the characteristic length is the height of the stove, H. And further, the rate of heat transfer is

$$q = hA(T_s - T_{inf})$$

(b) The radiation heat transfer is calculated as

$$q = \epsilon\sigma A(T_s^4 - T_{inf}^4)$$

In radiation it is important to use Kelvins and not Celsius!

The total heat transfer is $q_{tot} = q_{conv} + q_{rad}$

Correct answers:

(a): ~750W

(b): ~1100W