

HW5, PP3

Consider a hot water radiator for heating a room. The total power of heat transfer is

$$q_{tot} = q_{conv} + q_{rad}$$

And we know that

$$q_{conv} = 0.8 q_{tot}$$

$$q_{rad} = 0.2 q_{tot}$$

Calculate the surface areas from

$$q_{conv} = hA_{conv}(T_s - T_{inf})$$

And

$$q_{rad} = \epsilon \sigma A_{rad}(T_s^4 - T_{inf}^4)$$

The surface temperature can be approximated as the average water temperature.

Correct answers:

Convection area $\sim 27\text{m}^2$

Radiation area $\sim 5.5\text{m}^2$