Example

A 10-mm diameter pipe containing a condensing refrigerant is to be insulated with a material that has a conductivity of k_{insul} = 0.055 W/m-°C. For the air surrounding the pipe, T_{air} = 20°C and h_{air} = 5 W/m²-°C. The temperature of the refrigerant is –10°C. Assuming that the inside wall temperature is the same as the refrigerant temperature

(a) calculate the rate of heat transfer per unit pipe length for an insulation thickness of t = 2 mm, and
(b) t = 5 mm.