Assignment 1

$Q = kA \times \frac{\Delta T}{L} = (0.78)(20) \times \frac{25}{0.4}$

$= 15.6 \times 62.5$

$= 975\ W$

- $k = 0.78$
- $A = 20$
- $\Delta T = 25$
- $L = 0.4$

$Q = \frac{T_1 - T_2}{R_{wall}}$

$R_{wall} = \frac{L}{kA} = \frac{0.4}{0.78 \times 20} = \frac{0.4}{15.6} = 0.025641$

- $L = 0.4$
- $k = 0.78$
- $A = 20$

$Q = \frac{25}{0.0256} = 976.5625\ W$

$Q = \frac{25}{0.025641} = 975.000975\ W$

$Q \times 0.165$

Conductive heat transfer.

- Conduction means heat transfer thrugh Solids (for example the wall). the tempature inside is high than tempature outside or vise versa.
- Heat transfer thrugh a wall is one dimentional, (in the x direction) (agaomtical poperty)
- $\dot{Q}$ is the energy (J) rate per time (s) which is Paer (W)
- the equation to know the rate of change is

$\dot{Q}_{in} - \dot{Q}_{out} = \frac{dE_{wall}}{dt}$ → Rate of change.

$\dot{Q}_{in}$ ← this shows how much heat is going in

$\dot{Q}_{out}$ ↓ how much heat is going out

If $= \frac{dE_{wall}}{dt}$ is → − means you are cooling the wall; + means you are heating the wall; 0 means it is a steady transfer.

* Heat transfer $\dot{Q}$ (W) is in the x-direction & ⊥ to the plane (wall) of temperature difference.
* Fourier's Law of Heat Conduction where: $\dot{Q}$ = Conductive heat transfer rate.

(rate of steady heat conduction through a wall)

$\dot{Q}_{Cond.wall} = -kA\frac{dt}{dx}$ W

- k = means how Conductive the material is, transfering heat
- A = Area of material, area ⊥ to the heat transfer direction.
- $\frac{dt}{dx}$ → measures how much temprature changes in the x-direction. → we assume that it is a homogerous Chage.

Simplified Conclusion of Fourier's Law:

$$\dot{Q}_{Condu.wall} = KA \frac{T_1 - T_2}{L} = KA \frac{\Delta T}{L}$$

L: thickness of material

* the larger the thickness of the material, the less the heat transfer (they are proportional to one another).
* Heat transfer through the wall is Proportional to the Area.
* Also proportional to the difference of temprature (t) & Conductivity (k).

Conductivity: willingness of a material to tranfer heat where it is inversely proportional to the thickness → the thicker the material the less heat goes through the wall