Week 1 Exercise:

- **Conductive Heat Transfer:**

Is the transfer (gain or loss) of energy or heat through conductive materials and molecules, which can be in the form of solids, liquids or gas.

Heat transfer through the wall of a house can be modeled as steady and one-dimensional

The rate of heat conduction through a plane wall
- Is proportional to the average thermal conductivity (Insulation Quality), the wall area and the temperature difference between the sides that the wall is separating whether interior or exterior.
- Wall thickness affects the transfer of heat through it
- Once the rate of heat conduction is available, the temperature $T(x)$ at any location x can be determined by replacing t by T and L by x.

- **Exercise: L=0.4m, A=20m2, $\Delta T = 25$, and K=0.78w/mK.**

  - Simple method:

$$\dot{Q} = kA\frac{\Delta T}{L} \quad \frac{25}{0.4} \quad = \quad 975\ W$$

  - Resistance concept:

$$R_{wall} = \frac{L}{kA} \quad = \quad \frac{0.4}{0.78 \text{ x } 20} \quad = 0.0256\,°\frac{C}{W}$$

$$\dot{Q} = \frac{\Delta T}{R_{Wall}} \quad = \frac{25}{0.0256°\frac{C}{W}} \quad = 976.6\ W$$