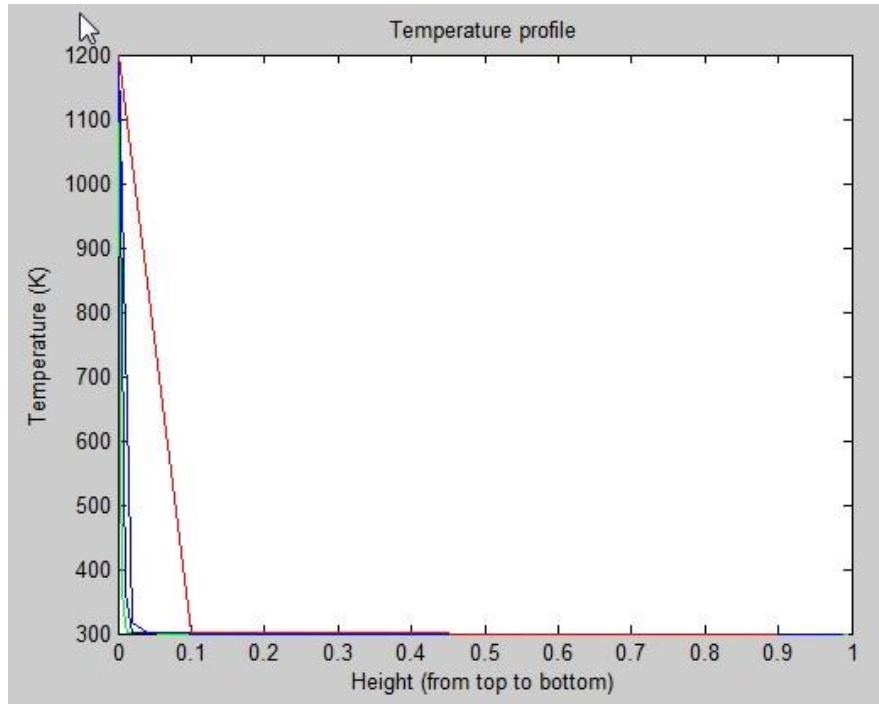


Temperature profile (against Height)

The following temperature profile was obtained :

The different lines are for different *number of grids*



Color Coding: (*No. Of grids*)

Red : 10

Blue : 50 (& 100)

Green : 300

This result was obtained after **100 seconds**.

Unexpected result since the lower layers will not remain at low temperatures.

Clearly, the error is not due to insufficient number of grids since it is greater for higher number grids.

The following method was used. (method of lines)

We use overall heat balance equation for the first grid.

$$mC * \left(\frac{dT}{dt}\right) = K * \left(\frac{d^2T}{dx^2}\right) + h(T - T_o) + e(Ts^4 - T^4)$$

For the other grids :

$$mC * \left(\frac{dT}{dt} \right) = K * \left(\frac{d^2T}{dx^2} \right) + h(T - T_o)$$

The odes were solved using **ode15s**

The spatial coordinate was discretized using 2nd order finite difference equations.

For the above results the parameter values were as follows (all S I units)

Thermal Conductivity = $0.1 \text{ J m}^{-1} \text{ s}^{-1} \text{ K}^{-1}$

Specific Heat = $1500 \text{ J kg}^{-1} \text{ K}^{-1}$

Density = 800 kg m^{-3}

Temperature Surface = 1200K

Air Temperature = 300 K

Length, Width , Height = 1m

Overall Heat transfer coefficient = $32 \text{ J s}^{-1} \text{ K}^{-1}$ (around this value)