

$$t_1 := \text{time}(0)$$

$$\mu\text{rad} \equiv 10^{-6} \cdot \text{rad}$$

$$\text{mrad} \equiv 10^{-3} \cdot \text{rad}$$

$$\mu\text{m} \equiv 10^{-6} \text{ m}$$

$$\text{nm} := 10^{-9} \text{ m}$$

$$\text{ms} \equiv 10^{-3} \cdot \text{s}$$

$$\mu\text{s} \equiv 10^{-6} \text{ s}$$

$$\text{ns} \equiv 10^{-9} \cdot \text{s}$$

$$\text{kt} \equiv 1852 \frac{\text{m}}{\text{hr}}$$

$$\text{nmi} := 1852 \cdot \text{m}$$

$$^{\circ}\text{C} \equiv \text{K}$$

$$c \equiv 2.99792458 \cdot 10^8 \frac{\text{m}}{\text{s}}$$

$$h \equiv 6.62606876 \cdot 10^{-34} \text{ J} \cdot \text{s}$$

$$r_e \equiv 6378140 \cdot \text{m}$$

$$\sigma \equiv 5.670400 \cdot 10^{-8} \cdot \frac{\text{watt}}{\text{m}^2 \cdot \text{K}^4}$$

$$\text{mJ} \equiv 10^{-3} \text{ J}$$

$$\text{MW} \equiv 10^6 \text{ W}$$

$$\text{nW} \equiv 10^{-9} \text{ W}$$

$$\mu\text{W} \equiv 10^{-6} \text{ W}$$

$$\text{mW} \equiv 10^{-3} \text{ W}$$

$$\text{time}(0) - t_1 = 0.0940$$

$$T_b := 273.15 \text{ K}$$

$$T_w := 160 \text{ K}$$

$$T_{in} := 1200 \text{ K}$$

$$T_a := 25 \text{ K}$$

$$h_{amb} := 5 \frac{\text{W}}{\text{m}^2 \cdot \text{K}}$$

$$h_a := 0.1 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$\text{thk} := 2 \text{ in}$$

given

$$\frac{h_a}{\text{thk}} [T_{in} - (T_w + T_b)] = 0.6 \cdot \sigma \cdot [(T_w + T_b)^4 - (T_a + T_b)^4] + h_{amb} \cdot (T_w - T_a)$$

$$T_w := \text{find}(T_w)$$

$$T_w = 154.7146 \text{ K}$$

$$0.6 \cdot \sigma \cdot [(T_w + T_b)^4 - (T_a + T_b)^4] = 871.3784 \frac{\text{W}}{\text{m}^2}$$

$$h_{amb} \cdot (T_w - T_a) = 648.5731 \frac{\text{W}}{\text{m}^2}$$

$$\frac{h_a}{\text{thk}} [T_{in} - (T_w + T_b)] = 1519.9515 \frac{\text{W}}{\text{m}^2}$$