

AME 20231

Homework 6

Due: Thursday, 29 February 2024, 9:00 AM, on CANVAS

1. 3.94, take instead the final temperature to be 48°C .
2. 3.102, take instead the final temperature to be 550 K.
3. 3.119, take instead the polytropic exponent to be $n = 1.45$.
4. 3.157. Estimate the total financial cost of this over one year. Estimate the fraction of the US Gross Domestic Product this represents. Identify and cite sources for used for your estimates.
5. You supervise an industrial process which uses forced convection to cool hot 10 g steel ball bearings. In the forced convection environment, the heat transfer coefficient is $h = 0.1 \text{ kW/m}^2/\text{K}$. The initial temperature is 1500 K. The ambient temperature is 300 K. Using the method developed in class, estimate the time constant of cooling, find an expression for $T(t)$, and find the time when $T = 350 \text{ K}$. Plot $T(t)$. Repeat the analysis for a 1 kg sphere.

Review 1 is also due.