3.1.1 Finger Exercise: Coffee temperature rate of change

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Finger Exercises 1 due Aug 3, 2023 05:00 IST Completed

Problem: Calculate temperature rate of change for a hot and cold day

0/2 points (graded)

MO2.4

Consider a cup of coffee for which following values apply:

$$m_c = 0.35\,\mathrm{kg}, \quad c_c = 4200\,\mathrm{J/(kgC)}, \tag{3.1}$$

$$h = 5\,\mathrm{W/(m^2C)}, \quad A = 0.04\,\mathrm{m^2} \tag{3.2}$$

Consider first a warm day in which the outside temperature is $T_{\mathrm{out}} = 25^\circ\mathrm{C}$. If the temperature of the coffee at some instant in time is $T_c = 40^\circ\mathrm{C}$, what is the rate of change of the coffee temperature (i.e. $\mathrm{d}T_c/\mathrm{d}t$) in units of $\mathrm{C/s}$? Provide your answer with three digits of precision (of the form X.YZeP where P is the base10 power).

-0.002 ✖ Answer: -2.040816326530612E-3

Now consider a cool day in which the outside temperature is $T_{\mathrm{out}} = 5^\circ\mathrm{C}$. If the temperature of the coffee is $T_c = 40^\circ\mathrm{C}$, what is the rate of change of the coffee temperature (i.e. $\mathrm{d}T_c/\mathrm{d}t$) in units of $\mathrm{C/s}$? Provide your answer with three digits of precision (of the form X.YZeP where P is the base10 power).

-0.005 ✖ Answer: -4.7619047619047615E-3

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Answers are displayed within the problem

SOLUTION: The solution will be available shortly after the due date in Section 3.2.1.