Newton’s Law of Cooling

Draw a graph of temperature versus time of what you think happens when you bake cookies in the oven at 350°F for 12 minutes and then take them out and let them cool in kitchen set at a constant 70°F.

The temperature $u(t)$ of a heated object at a given time $t$ can be modeled by

$$U(t) = T + (u_0 - T)e^{kt}$$

$u_0$ = initial temperature of heated object

$T$ = constant temperature of the surrounding medium

$k$ is a negative constant

Add this to your notecard

Temperature of the Outdoors Example

A thermometer is taken from a room that is 20°C to the outdoors where the known temperature is 5°C. After one minute, the thermometer adjusts and reads 12°C.

Important Question “what happens as you bring a thermometer from inside to outside?”

(Always ask ‘what is the heated object?’ In this case, the thermometer.)

1) Use the information to find ‘$k$’ and come up with a general equation.

2) What will the reading of the thermometer read after 1 more minute?

3) When will the thermometer read 6°C?

CSI Example

The great detective Sherlock Holmes and his assistant, Dr. Watson, are discussing the murder of actor Cornelius McHam. McHam was shot in the head, and his understudy, Barry Moore, was found standing over the body with the murder weapon in hand. Let’s listen in:


Holmes: Not so fast, Watson – you are forgetting Newton’s Law of Cooling!

Watson: Huh?

Holmes: Elementary, my dear Watson. Moore was found standing over McHam at 10:06 p.m., at which time the coroner recorded a body temperature of 77.9°F and noted that the room thermostat was set to 72°F. At 11:06 p.m. the coroner took another reading and recorded a body temperature of 75.6°F. Since McHam’s normal temperature was 98.6°F, and since Moore was on stage between 6:00 p.m. and 8:00 p.m., Moore is obviously innocent.

How did Holmes know that Moore was innocent?

Complete page 335 #13A and 13C (algebraically). Also #14A,B