Newton's Law of Cooling

Caleb J. Emmons

Follow this and additional works at: https://scholarship.claremont.edu/jhm

Part of the Ordinary Differential Equations and Applied Dynamics Commons

Recommended Citation

©2016 by the authors. This work is licensed under a Creative Commons License.

JHM is an open access bi-annual journal sponsored by the Claremont Center for the Mathematical Sciences and published by the Claremont Colleges Library | ISSN 2159-8118 | http://scholarship.claremont.edu/jhm/

The editorial staff of JHM works hard to make sure the scholarship disseminated in JHM is accurate and upholds professional ethical guidelines. However the views and opinions expressed in each published manuscript belong exclusively to the individual contributor(s). The publisher and the editors do not endorse or accept responsibility for them. See https://scholarship.claremont.edu/jhm/policies.html for more information.
Newton’s Law of Cooling

Caleb Emmons
caleb.emmons@gmail.com

Postulate.

The change in an object’s temperature is proportional to the difference between its own and the ambient temperature.

Translate.

\[ \frac{dT}{dt} = -k(T - T_a) \]

Separate.

\[ \frac{dT}{T - T_a} = -k \, dt \]

Integrate.

\[ \ln(T - T_a) = -kt + C \]

Exponentiate.

\[ T - T_a = e^{-kt+C} \]

Evaluate.

\[ T_0 - T_a = e^C \]

Restate.

\[ T = T_a + (T_0 - T_a)e^{-kt} \]

In class, many flakes of chalk expended, asking us about piping hot soup from the stove placed on the countertop. How long until it is cool enough to taste? The temperature of the food asymptotically approaching room temperature, edging closer and closer, but never quite reaching. The approach an exponential: the time to halve the difference is always the same. In the graph, the curve drops precipitously, a daredevil at the local airshow, who slowly pulls the stick up and skims the ground. A neat solution, the soup is eaten, and then the eraser cleans it all up. Always looking forward.

So look back, friend.

The soup never forgets the stove, being always a little hotter.

After class you came to me, whispering “All approaches to ambient are asymptotic...”–or was it “Taste me?”

My heart was lain next to yours, and absorbed your fire.

In the night, I touched the alarming heat of your sex.

As I move through space and time, even now I am marked by that touch.

My molecules indelibly aroused.

In class, many flakes of chalk expended, asking us about piping hot soup from the stove placed on the countertop. How long until it is cool enough to taste? The temperature of the food asymptotically approaching room temperature, edging closer and closer, but never quite reaching. The approach an exponential: the time to halve the difference is always the same. In the graph, the curve drops precipitously, a daredevil at the local airshow, who slowly pulls the stick up and skims the ground. A neat solution, the soup is eaten, and then the eraser cleans it all up. Always looking forward.

So look back, friend.

The soup never forgets the stove, being always a little hotter.

After class you came to me, whispering “All approaches to ambient are asymptotic...”–or was it “Taste me?”

My heart was lain next to yours, and absorbed your fire.

In the night, I touched the alarming heat of your sex.

As I move through space and time, even now I am marked by that touch.

My molecules indelibly aroused.