

## Newton's Law of Cooling

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# Newton's Law of Cooling

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<p>Postulate. <i>The change in an object's temperature is proportional to the difference between its own and the ambient temperature.</i></p> <p>Translate. <math display="block">\frac{dT}{dt} = -k(T - T_a)</math></p> <p>Separate. <math display="block">\frac{dT}{T - T_a} = -k dt</math></p> <p>Integrate. <math display="block">\ln(T - T_a) = -kt + C</math></p> <p>Exponentiate. <math display="block">T - T_a = e^{-kt+C}</math></p> <p>Evaluate. <math display="block">T_0 - T_a = e^C</math></p> <p>Restate. <math display="block">T = T_a + (T_0 - T_a)e^{-kt}</math></p>	<p>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.</p>	<p>So look back, friend.</p> <p>The soup never forgets the stove, being always a little hotter.</p> <p>After class you came to me, whispering "All approaches to ambient are asymptotic..."—or was it "Taste me?"</p> <p>My heart was lain next to yours, and absorbed your fire.</p> <p>In the night, I touched the alarming heat of your sex.</p> <p>As I move through space and time, even now I am marked by that touch.</p> <p>My molecules indelibly aroused.</p>
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