

Calculus James Steward 3.8 Lecture Notes

Lesson 274 | Calculus AB | Exponential change and cooling

https://www.youtube.com/watch?v=x35Hx-_Gc80

Related review: exact coverage needs teacher confirmation.

Name: _____ Date: _____ Show your reasoning.

01

An object in a 20°C room starts at 140°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

02

An object in a 10°C room starts at 40°C . The excess above room temperature halves every 2 minutes. Write $T(t)$ and find $T(4)$.

03

An object in a 15°C room starts at 75°C . The excess above room temperature halves every 2 minutes. Write $T(t)$ and find $T(4)$.

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Name: _____ Date: _____ Show your reasoning.

04

An object in a 10°C room starts at 120°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

05

An object in a 15°C room starts at 65°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

06

An object in a 55°C room starts at 135°C . The excess above room temperature halves every 2 minutes. Write $T(t)$ and find $T(4)$.

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01

An object in a 20°C room starts at 140°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

Newton cooling gives $T(t) = 20 + 120e^{(-kt)}$, with $k = \ln 2/5$. Equivalently $20 + 120(1/2)^{(t/5)}$. At $t = 10$, $T = 50^{\circ}\text{C}$.

02

An object in a 10°C room starts at 40°C . The excess above room temperature halves every 2 minutes. Write $T(t)$ and find $T(4)$.

Newton cooling gives $T(t) = 10 + 30e^{(-kt)}$, with $k = \ln 2/2$. Equivalently $10 + 30(1/2)^{(t/2)}$. At $t = 4$, $T = 35/2^{\circ}\text{C}$.

03

An object in a 15°C room starts at 75°C . The excess above room temperature halves every 2 minutes. Write $T(t)$ and find $T(4)$.

Newton cooling gives $T(t) = 15 + 60e^{(-kt)}$, with $k = \ln 2/2$. Equivalently $15 + 60(1/2)^{(t/2)}$. At $t = 4$, $T = 30^{\circ}\text{C}$.

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04

An object in a 10°C room starts at 120°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

Newton cooling gives $T(t)=10+110e^{(-kt)}$, with $k=\ln 2/5$. Equivalently $10+110(1/2)^{(t/5)}$. At $t=10$, $T=75/2^{\circ}\text{C}$.

05

An object in a 15°C room starts at 65°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

Newton cooling gives $T(t)=15+50e^{(-kt)}$, with $k=\ln 2/5$. Equivalently $15+50(1/2)^{(t/5)}$. At $t=10$, $T=55/2^{\circ}\text{C}$.

06

An object in a 55°C room starts at 135°C . The excess above room temperature halves every 2 minutes. Write $T(t)$ and find $T(4)$.

Newton cooling gives $T(t)=55+80e^{(-kt)}$, with $k=\ln 2/2$. Equivalently $55+80(1/2)^{(t/2)}$. At $t=4$, $T=75^{\circ}\text{C}$.