

Calculus 3.8 and 3.9 Sample Quiz Questions and Review

Lesson 278 | Calculus AB | Related rates • Exponential change and cooling

<https://www.youtube.com/watch?v=tnv2sHAdGkc>

Related review: exact coverage needs teacher confirmation.

Name: _____ Date: _____ Show your reasoning.

01

A sphere radius increases at 9 cm/s. At radius 13 cm, find dV/dt .

02

An object in a 40°C room starts at 80°C . The excess above room temperature halves every 3 minutes. Write $T(t)$ and find $T(6)$.

03

A sphere radius increases at 8 cm/s. At radius 9 cm, find dV/dt .

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Name: _____ Date: _____ Show your reasoning.

04

An object in a 70°C room starts at 130°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

05

A sphere radius increases at 11 cm/s. At radius 3 cm, find dV/dt .

06

An object in a 45°C room starts at 175°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

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01

A sphere radius increases at 9 cm/s. At radius 13 cm, find dV/dt .

$V = (4/3)\pi r^3$. Differentiate in time: $dV/dt = 4\pi r^2 dr/dt$. Substitute after differentiation: 6084π cm³/s.

02

An object in a 40°C room starts at 80°C. The excess above room temperature halves every 3 minutes. Write $T(t)$ and find $T(6)$.

Newton cooling gives $T(t) = 40 + 40e^{(-kt)}$, with $k = \ln 2/3$. Equivalently $40 + 40(1/2)^{(t/3)}$. At $t=6$, $T=50^\circ\text{C}$.

03

A sphere radius increases at 8 cm/s. At radius 9 cm, find dV/dt .

$V = (4/3)\pi r^3$. Differentiate in time: $dV/dt = 4\pi r^2 dr/dt$. Substitute after differentiation: 2592π cm³/s.

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04

An object in a 70°C room starts at 130°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

Newton cooling gives $T(t) = 70 + 60e^{(-kt)}$, with $k = \ln 2/5$. Equivalently $70 + 60(1/2)^{(t/5)}$. At $t=10$, $T=85^{\circ}\text{C}$.

05

A sphere radius increases at 11 cm/s. At radius 3 cm, find dV/dt .

$V = (4/3)\pi r^3$. Differentiate in time: $dV/dt = 4\pi r^2 dr/dt$. Substitute after differentiation: $396\pi \text{ cm}^3/\text{s}$.

06

An object in a 45°C room starts at 175°C . The excess above room temperature halves every 5 minutes. Write $T(t)$ and find $T(10)$.

Newton cooling gives $T(t) = 45 + 130e^{(-kt)}$, with $k = \ln 2/5$. Equivalently $45 + 130(1/2)^{(t/5)}$. At $t=10$, $T=155/2^{\circ}\text{C}$.