

Watch. Practice. Understand. | Lesson 277

2021 In Depth Related Rates (James Steward Section 3.9)

Watch the matching video: <https://www.youtube.com/watch?v=JNV3TPtCNWY>

Practice focus: Related rates

Original extra practice matched to the listed lesson topic.

Name: _____ Date: _____ Show your reasoning and check units.

01 A circle's radius increases at 2 cm/s. How fast is area increasing when $r=5$ cm?

02 A 10-ft ladder has foot moving away at 1 ft/s. Find the top's vertical rate when its foot is 6 ft away.

03 A sphere's radius grows at 0.5 cm/s. Find volume rate when $r=4$.

04 A square's area grows at $24 \text{ cm}^2/\text{s}$ when side length is 6 cm. Find the side's rate.

Worked answers | Lesson 277

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01 A circle's radius increases at 2 cm/s. How fast is area increasing when $r=5$ cm?

$A=\pi r^2$ gives $dA/dt=2\pi r \, dr/dt=20\pi \text{ cm}^2/\text{s}$.

02 A 10-ft ladder has foot moving away at 1 ft/s. Find the top's vertical rate when its foot is 6 ft away.

$x^2+y^2=100$; $y=8$. Differentiate: $x \, x' + y \, y' = 0$. $y' = -(6/8)(1) = -3/4 \text{ ft/s}$.

03 A sphere's radius grows at 0.5 cm/s. Find volume rate when $r=4$.

$V=4\pi r^3/3$ gives $V'=4\pi r^2 r' = 32\pi \text{ cm}^3/\text{s}$.

04 A square's area grows at $24 \text{ cm}^2/\text{s}$ when side length is 6 cm. Find the side's rate.

$A=s^2$ implies $A'=2ss'$; $s'=24/(12)=2 \text{ cm/s}$.