Intro to Related Rates

1) Translate verbal statements into mathematical expressions.

2) Take derivatives of commonly known formulas with respect to time.

Lesson objectives | Teachers' notes

Nov 4-10:28 AM

What are related rates?

https://www.youtube.com/watch?v=Qd60IMwBuXE

Feb 11-8:18 AM

Translate the following to calculus notation.

1. The volume of a cylinder is increasing at a rate of 6 cubic feet per second.

$$\frac{dV}{dt} = 6\frac{ft^3}{sec}$$

2. The depth of water in a rectangular pool is decreasing at a rate of 2 inches per hour.

$$\frac{dh}{dt} = -2\frac{in}{hr}$$

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3. At rush hour, the number of vehicles going through the SunPass toll booth is increasing a rate of 85 vehicles per hour.

$$\frac{dv}{dt} = 85\frac{vehicles}{hr}$$

4. Air is escaping from a spherical balloon at the rate of 15 cubic centimeters per second.

$$\frac{dV}{dt} = -15\frac{cm^3}{sec}$$

Sep 27-6:51 AM

In the formulas below, take the derivative with respect to time. Remember to consider which variables change with respect to time before you take the derivative.

5. Area of a rectangle: $A = lw$

$$\frac{dA}{dt} = l\frac{dw}{dt} + w\frac{dl}{dt}$$

6. Circumference of a circle: $C = 2\pi r$

$$\frac{dC}{dt} = 2\pi\frac{dr}{dt}$$

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7. Volume of a cube: $V = s^3$

$$\frac{dV}{dt} = 3s^2\frac{ds}{dt}$$

8. Lateral surface area of cylinder: $S = 2\pi rh$

$$\frac{dS}{dt} = 2\pi\left[r\frac{dh}{dt} + h\frac{dr}{dt}\right]$$

Nov 13-5:30 AM

9. Area of a circle: $A = \pi r^2$

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

10. Perimeter of a square: $P = 4s$

$$\frac{dP}{dt} = 4\frac{ds}{dt}$$

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11. Volume of a cylinder: $V = \pi r^2 h$

$$\frac{dV}{dt} = \pi r^2 \frac{dh}{dt} + 2\pi r \frac{dr}{dt} h$$
$$= \pi r^2 \frac{dh}{dt} + 2\pi r h \frac{dr}{dt}$$

12. Volume of a Cone: $V = \frac{1}{3}\pi r^2 h$

$$V = \frac{\pi}{3} r^2 h$$
$$\frac{dV}{dt} = \frac{\pi}{3}\left[r^2 \frac{dh}{dt} + 2rh\frac{dr}{dt}\right]$$

Jul 28-9:01 AM

13. Volume of a Sphere: $V = \frac{4}{3}\pi r^3$

$$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$$

14. Side lengths of a triangle: $x^2 + y^2 = 25$

$$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$$

Nov 13-5:32 AM