

I am Key

AP Calculus AB: 5.6 Intro to Related Rates

Translate the following to calculus notation.

1. A triangles area is increasing at a rate of 4 ^{square} meter every second. $\frac{dA}{dt} = 4 \frac{m^2}{sec}$

2. Water is poured onto the floor. The radius of the water is increasing at a rate of 2 inches per second. $\frac{dr}{dt} = 2 \frac{in}{sec}$

3. The angle of a triangle is decreasing at a rate of $\frac{\pi}{3}$ radians per second. $\frac{d\theta}{dt} = -\frac{\pi}{3} \frac{rad}{sec}$

4. The volume of a sphere is decreasing at a rate of 4 ^{cubic} centimeters per minute. $\frac{dV}{dt} = -4 \frac{cm^3}{min}$

Find derivative of each of the following formulas with respect to time (t).

5. Volume of a cube: $V = s^3$ $\frac{dV}{dt} = 3s^2 \frac{ds}{dt}$

6. Area of a rectangle: $A = lw$ $\frac{dA}{dt} = w \frac{dl}{dt} + l \frac{dw}{dt}$

7. Perimeter of a rectangle: $P = 2l + 2w$ $\frac{dP}{dt} = 2 \frac{dl}{dt} + 2 \frac{dw}{dt}$

8. Volume of a sphere: $V = \frac{4}{3}\pi r^3$ $\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$

9. Pythagorean Theorem: $a^2 + b^2 = c^2$ $2a \frac{da}{dt} + 2b \frac{db}{dt} = 2c \frac{dc}{dt}$

10. Surface area of a cylinder: $SA = 2\pi rh + 2\pi r^2$ $\frac{dSA}{dt} = [h 2\pi \frac{dr}{dt} + 2\pi r \frac{dh}{dt}] + 4\pi r \frac{dr}{dt}$

~~11. Volume of a sphere: $V = \frac{4}{3}\pi r^3$ $\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$~~

12. Volume of a cone: $V = \frac{1}{3}\pi r^2 h$ $\frac{dV}{dt} = [h \frac{2}{3}\pi r \frac{dr}{dt} + \frac{1}{3}\pi r^2 \frac{dh}{dt}]$