7.5 Related Rates II

Wednesday, June 12, 2019 7:14 AM

* Every time you take the derivative of a variable, you must multiply by $\frac{d}{dt}$
* $\frac{d}{dt}$ represent rates of change

Length	Rate of Change
Increasing	Positive
Constant	Zero
Decreasing	Negative

Area of a triangle: $A = \frac{1}{2}bh$
Area of a circle: $A = \pi r^2$
Circumference: $C = 2\pi r$

Surface area of a sphere: $SA = 4\pi r^2$
Surface area of a cube: $SA = 6x^2$

Volume of a sphere: $V = \frac{4}{3}\pi r^3$
Volume of a cube: $V = s^3$
Volume of a cylinder: $V = \pi r^2 h$
Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

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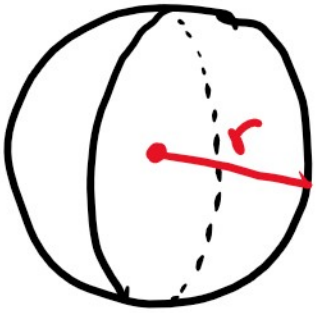
The radius of a sphere has a length of 24 feet but is decreasing at a rate of 3 yards per minute. How fast is the surface area of the sphere changing?



$SA = 4\pi r^2$

$r = 24\text{ ft} = 8\text{ yards}$

$\frac{dSA}{dt} = ???$

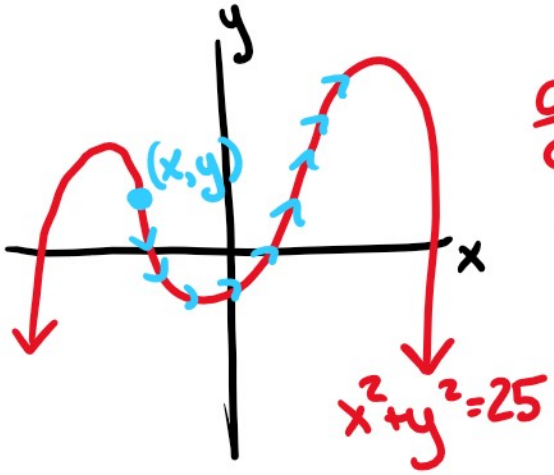
$\frac{dr}{dt} = -3$

$\frac{dSA}{dt} = 8\pi r \cdot \frac{dr}{dt}$

$\frac{dSA}{dt} = 8\pi(8)(-3)$

$\frac{dSA}{dt} = -192\pi$ or -603.19

A point is moving along the graph of $x^2 + y^2 = 25$ so that its x-coordinate changes at a rate of 2 units per second. When x is 3 units, what is the rate of change in the y-coordinate?



$\frac{dx}{dt} = 2$

$x = 3$

$\frac{dy}{dt} = ???$

$x^2 + y^2 = 25$

$(3)^2 + y^2 = 25$

$9 + y^2 = 25$

$y = 4$

$x^2 + y^2 = 25$

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

$2(3)(2) + 2(4)\frac{dy}{dt} = 0$

$12 + 8\frac{dy}{dt} = 0$

$\frac{dy}{dt} = -\frac{12}{8} = -\frac{3}{2}$

$$\frac{dy}{dt} = \frac{-12}{8} = \boxed{\frac{-3}{2}}$$