5.6 Day 2 (Monday 10/21)

Friday, October 18, 2019 11:25 AM

5.6B Notes - More Related Rates Problems

1. Air is being pumped into a spherical balloon at a rate of 4.5 cubic feet per minute. Find the rate of change of the radius when the radius is 2 feet.

$\frac{dV}{dt} = 4.5$

$r = 2$ ft

$V = \frac{4}{3}\pi r^3$

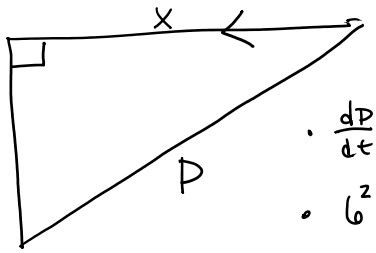
$4.5 = 4\pi(2)^2 \frac{dr}{dt}$

$\frac{dr}{dt} = \frac{4.5}{16\pi}$

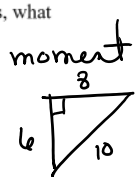
$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$

$\frac{dr}{dt} \approx 0.090$ ft/min

2. An airplane is flying on a flight path that will take it directly over a radar tracking station. The plane is flying at a constant altitude of 6 miles above the ground. If the distance between the radar and plane is decreasing at a rate of 400 miles per hour when the distance is 10 miles, what is the speed of the plane?



moment



$x = 8$

$D = 10$

- $\frac{dD}{dt} = -400$
- $6^2 + x^2 = D^2$
- $2x\frac{dx}{dt} = 2D\frac{dD}{dt}$

$x\frac{dx}{dt} = D\frac{dD}{dt}$

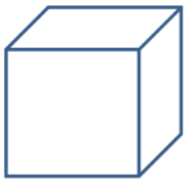
$8\frac{dx}{dt} = 10(-400)$

$\frac{dx}{dt} = -500$

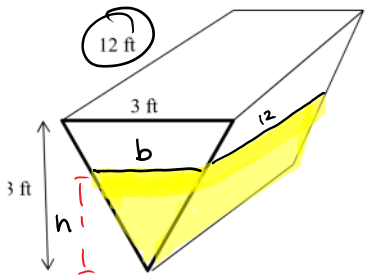
SPEED:

500 mph

3. All edges of a cube are expanding at a rate of 6 cm/sec. How fast is the volume changing when the edges are: a) 2 cm b) 10 cm?



4. A trough is 12 feet long and 3 feet across the top. Its ends are isosceles triangles with altitudes of 3 feet. If water is being pumped into the trough at 2 cubic feet per minute, how fast is the water level rising when the depth of the water (h) is 1 foot?



$\frac{b}{h} = \frac{3}{3}$

$b = 1h$

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

B = Area of base

$V = B \cdot h$

$V = B \cdot 12$

$V = \frac{1}{2}bh \cdot 12$

$V = 6b \cdot h$

$V = 6h \cdot h$

$V = 6h^2$

$\frac{dV}{dt} = 12h \frac{dh}{dt}$

$2 = 12 \frac{dh}{dt}$

$\frac{dh}{dt} = \frac{1}{6}$ ft/min