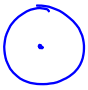
WARM UP

A stone is dropped into a lake, creating a circular ripple that travels outward so that the radius is changing at a speed of 25 cm/s. Find the rate at which the area within the circle is increasing after 4 seconds.

After 4 sec, $r = 100$



$\frac{dr}{dt} = 25$

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

$t = 4$ sec

$A = \pi r^2$

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

$\frac{dA}{dt} = 2\pi r (25)$

$\frac{dA}{dt} = 2\pi(100)(25)$

$\frac{dA}{dt} = 5000\pi \ cm^2/s$

Apr 28-7:29 PM

Circumference/Perimeter

Perimeter: Add the sides

Circle: $C = 2\pi r$ or $C = \pi d$

Surface area of Prism

- add the areas of all faces

- cylinder: $2\pi r^2 + 2\pi rh$

Volume of rect. prism

$V = l \times w \times h$

Area

$\triangle$: $A = \frac{1}{2}bh$

▭ : $A = l \times w$

◯ : $A = \pi r^2$

May 17-10:23 AM

Calculus 120

Unit 4: Applications of Differentiation

May 17, 2019: Day #14

1. Optimization Assignments Returned

2. Related Rates Assignment Handed Out

Jan 9-1:43 PM

Curriculum Outcomes

C8: Use Calculus techniques to sketch the graph of a function.

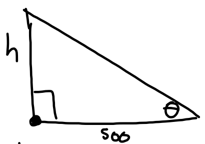
C9: Use Calculus techniques to solve optimization problems

C11: Use Calculus techniques to solve problems involving related rates.

Jan 24-9:32 AM

A hot air balloon rising straight up from a level field is tracked by a range finder 500 feet from the lift off point. At the moment the range finder's elevation angle is $\frac{\pi}{4}$, the angle is increasing at a rate of 0.14 radians per minute. How fast is the balloon rising at that moment?

Ans = 140



$\frac{d\theta}{dt} = 0.14$ $\frac{dh}{dt} = ?$

$\theta = \frac{\pi}{4}$

$\tan\theta = \frac{h}{500}$

$\tan\theta = \frac{1}{500}h$

$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{500}\frac{dh}{dt}$

$\left(\sec\frac{\pi}{4}\right)^2(0.14) = \frac{1}{500}\frac{dh}{dt}$

$(\sqrt{2})^2(0.14) = \frac{1}{500}\frac{dh}{dt}$

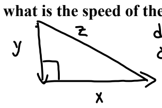
$0.28 = \frac{1}{500}\frac{dh}{dt}$

$140 \ ft/min = \frac{dh}{dt}$

May 16-1:35 PM

A police cruiser, approaching a right-angled intersection from the north, is chasing a speeding car that has turned the corner and is now moving straight east. When the cruiser is 0.6 mi north of the intersection and the car is 0.8 mi to the east, the police determine with radar that the distance between them and the car is increasing at 20 mph. If the cruiser is moving at 60 mph at the instant of measurement, what is the speed of the car?

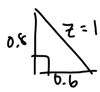
Ans = 70 mph



$\frac{dy}{dt} = -60$ $y = 0.6$

$\frac{dx}{dt} = ?$ $x = 0.8$

$\frac{dz}{dt} = 20$



$x^2 + y^2 = z^2$

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

$2(0.8)\left(\frac{dx}{dt}\right) + 2(0.6)(-60) = 2(1)(20)$

$1.6\frac{dx}{dt} - 72 = 40$

$1.6\frac{dx}{dt} = 112$

$\frac{dx}{dt} = \frac{112}{1.6}$

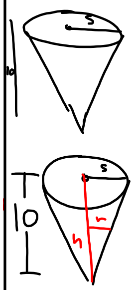
$\frac{dx}{dt} = 70$ mph

May 16-11:47 AM

Water runs into a conical tank at a rate of 9 ft³/min. The tank stands point down and has a height of 10 ft and a base radius of 5 ft. How fast is the water level rising when the water is 6 ft deep?

Volume of Cone $= \frac{1}{3}\pi r^2 h$

Ans = 1/pi



$\frac{dV}{dt} = 9$

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

$h = 6$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\pi\left(\frac{1}{2}h\right)^2 h$

$V = \frac{1}{3}\pi \frac{1}{4}h^2 h$

$\boxed{V = \frac{1}{12}\pi h^3}$

$\frac{5}{10} = \frac{r}{h}$

$5h = 10r$

$r = \frac{5h}{10}$

$\boxed{r = \frac{1}{2}h}$

May 18-10:15 AM

A spotlight on the ground shines on a wall 10 m away. A man 2 m tall walks from the spotlight toward the wall at a speed of 1.2 m/s. How fast is his shadow on the wall decreasing when he is 3 m from the wall?

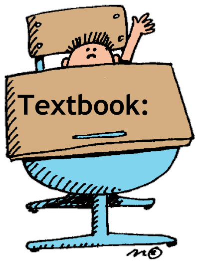
ans = -24/49

May 8-9:07 AM

A man starts walking north at a speed of 1.5 m/s and a woman starts at the same point at the same time walking west at a speed of 2 m/s. At what rate is the distance between them increasing one minute later?

Ans = 2.5

May 8-9:12 AM



Assignment!

Jan 13-9:38 PM

May 18-10:18 AM

Attachments

2.1_74_AP.html

2.1_74_AP.swf

2.1_74_AP.html