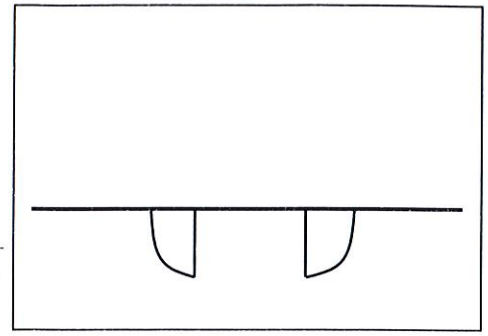
Homework Guide

AP Calculus
Turvey for Related Rates

Name___________________Pd.__
Application of Derivatives Day 3



Here is the title right side up:

“_ _.”
5 2 6 3 13 4 7 5 2

Here is the title upside down:

“_ _ _ _ _ _ _ _ _ _ _, _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
8 12 6 11 7 9 6 10 8 10 6 3 9 10 1

_ _ _ _ _ _.”
8 7 14 6

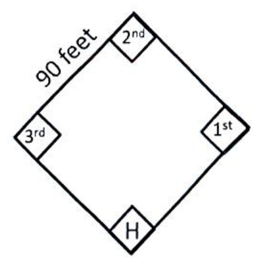
B	C	D	F	G	H	K	L	M	N	P	R	S	T	V	W
0	$\frac{1}{2\pi}$	$5\sqrt{5}$	$-\frac{1}{20\pi}$	$-\frac{5}{2\pi}$	7.938	2	$-\frac{5}{8\pi}$	180π	$\frac{5}{2}$	7.906	$\frac{3}{\pi}$	$\frac{12}{\pi}$	20π	$-.927$	-1.855

1. A certain calculus student hit Mrs. MacIntyre in the head with a snowball. If the snowball is melting at a rate of 10 cubic feet per minute, at what rate is the radius changing when the snowball is 1 foot in radius?
2. At what rate is the radius changing when the snowball is 2 feet in radius?

To Easy to help :)

3. Each side of a baseball diamond is 90 feet. Coach Richardson runs from first base to second base at 25 feet per second. How fast is he moving away from home plate when he is 30 feet from first base?
4. How fast is he moving away from home plate when he is 45 feet from first base?

Day 2 Helped with baseball diamond problem :)



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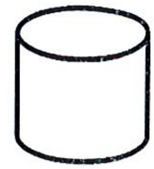
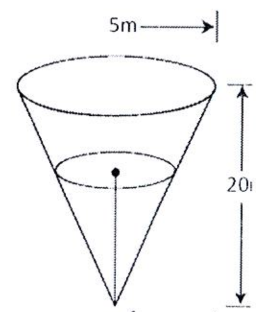
5. Water flows at 8 cubic feet per minute into a cylinder with radius 4 feet. How fast is the water level rising when the water is 2 feet high?



6. The Hillgrove High School swimming pool is an inverted cone with height 20 meters and radius 5 meters. It is being filled by Coach Bisesi with a hose which pumps in water at the rate of 3 cubic meters per minute. When the water level is 2 meters, how fast is the water level rising?

7. How fast is the radius changing at this moment?



$\boxed{6.}$ K: $\frac{dV}{dt} = 3\frac{m^3}{min}$

F: $\frac{dh}{dt} =$ ___

W: $h = 2m$

Eqn: $V = \frac{\pi}{3}R^2h$

Solve for R: $\frac{5}{20} = \frac{R}{h}$ $\quad 20R = 5h$ $\quad R = \frac{1}{4}h$

$V = \frac{\pi}{3}\left(\frac{1}{4}h\right)^2 h$

$V = \frac{\pi}{3}\cdot\frac{1}{16}h^2\cdot h$

$V = \frac{\pi}{48}h^3$

Der: $\frac{d}{dt}[V] = \frac{d}{dt}\left[\frac{\pi}{48}h^3\right]$

$\frac{dV}{dt} = \frac{\pi}{48}\cdot 3h^2\cdot\frac{dh}{dt}$

$\frac{dV}{dt} = \frac{\pi}{16}h^2\frac{dh}{dt}$

Sub: $3\frac{m^3}{min} = \frac{\pi}{16}(2m)^2\frac{dh}{dt}$

$3\frac{m^3}{min} = \frac{\pi}{\cancel{16}\,4}\cdot\cancel{4}m^2\frac{dh}{dt}$

$\frac{4}{\pi m^2}\cdot 3\frac{m^3}{min} = \frac{\pi m^2}{4}\frac{dh}{dt}\cdot\frac{4}{\pi m^2}$

$\boxed{\frac{dh}{dt} = \frac{12}{\pi}\frac{m}{min}} = S$

$\boxed{7.}$ K: $\frac{dV}{dt} = 3\frac{m^3}{min}$

F: $\frac{dR}{dt}$

W: $R =$ ___

$h = 2m$

use $\frac{5}{20} = \frac{R}{h}$ to solve for R

Eqn: Get Rid of h by solving proportion for R

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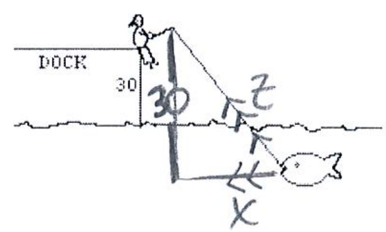
8. A stone is dripped into Lake Allatoona, causing circular ripples whose radii increase by 2 meters/second. How fast is the disturbed area growing when the outer ripple has radius 5 meters?
9. How fast is the radius increasing at that moment?

Just formula problem :) No help :)

10. A fish is being reeled in at a rate of 2 m/s (that is, the fishing line is being shortened by 2m/s) by a fisherman at Allatoona. If the fisherman is sitting on the dock 30 meters above the water, how fast is the fish moving through the water when the line is 50 meters long?
11. How fast is the fish moving when the line is only 31 meters long?

Pythagorean Thm problem :)



12. A student at Hillgrove was painting the high school and standing at the top of a 25-foot ladder. She was horrified to discover that the ladder began sliding away from the base of the school at a constant rate of 2 feet per second. At what rate was the top of the ladder carrying her toward the ground when the base of the ladder was 17 feet away from the school.

Almost exactly like one in notes :)

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13. A spherical balloon was losing air at the rate of 5 cubic inches per second. At what rate is the radius of the balloon decreasing when the radius equals 5 inches?

:) No help

14. Oil spills into Lake Allatoona in a circular pattern. If the radius of the circle increases at a constant rate of 3 feet per minute, how fast is the area of the spill increasing at the end of 10 minutes?

:) No help