Today's Plan:

Learning Target (standard): I will solve real-world related rate application problems.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Related Rates Worksheet

5) $\frac{8}{25\pi}\ ft/\min$

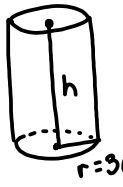
6) $-2rad/\sec$

7) $\frac{7}{50}rad/\min$

8) $-\frac{1}{72}rad/\sec$

9) $\frac{119}{36}\ ft^2/\sec$

A cylindrical tumbler with a radius of 3 cm has its height increasing at a rate of 2.5 cm/sec. Find the rate of change of the volume of the cylinder when its height is 12.56 cm.



$\frac{dh}{dt} = 2.5 \text{ cm/sec}$ $\frac{dr}{dt} = 0$ ↑ does not change

$\frac{dV}{dt} = ?$ when $h = 12.56 \text{ cm}$

$V = \pi r^2 h$

$\frac{dV}{dt} = 2\pi r h \frac{dr}{dt} + \pi r^2 \frac{dh}{dt}$

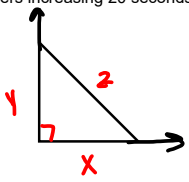
$\frac{dV}{dt} = 2\pi(3)(12.56)(0) + \pi(3)^2(2.5)$

$\frac{dV}{dt} = 9\pi(2.5)$

$\frac{dV}{dt} = 22.5\pi \text{ cm}^3/\text{sec}$

$\frac{dV}{dt} = \frac{45\pi}{2} \text{ cm}^3/\text{sec}$

Two people on bikes are at the same place. One of the bikers starts riding directly north at a rate of 8 m/sec. Five seconds after the first biker started riding north, the second starts to ride directly east at a rate of 5 m/sec. At what rate is the distance between the two riders increasing 20 seconds after the second person started riding?



$\frac{dy}{dt} = 8 \text{ m/sec}$ $\frac{dz}{dt} = ?$

$\frac{dx}{dt} = 5 \text{ m/sec}$ when 20 sec have passed for rider 2

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

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

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

$100(5) + 200(8) = 100\sqrt{5}\frac{dz}{dt}$

$500 + 1600 = 100\sqrt{5}\frac{dz}{dt}$

$2100 = 100\sqrt{5}\frac{dz}{dt}$

$\frac{21}{\sqrt{5}} = \frac{dz}{dt}$

$\frac{dz}{dt} = \frac{21\sqrt{5}}{5} \text{ m/sec}$

rider 1 (y): 25 sec

$y = 8(25) = 200 \text{ m}$

rider 2 (x): 20 sec

$x = 5(20) = 100 \text{ m}$

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

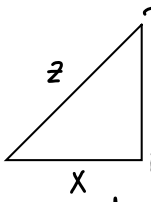
$100^2 + 200^2 = z^2$

$10000 + 40000 = z^2$

$\sqrt{z^2} = \sqrt{50000}$

$z = 100\sqrt{5}, -100\sqrt{5}$

At 1:00 pm, ship A is 25 miles due south of ship B. If ship A is sailing west at a rate of 16 mph and ship B is sailing south at a rate of 20 mph, find the rate at which the distance between the ships is changing at 1:30 pm.



$\frac{dy}{dt} = -20\text{mph}$

$\frac{dz}{dt} = ?$ @ $t = \frac{1}{2}\text{hr}$

A to B was 25 miles

$\frac{dx}{dt} = 16\text{mph}$

$x = 16(\frac{1}{2}) = 8\text{mi}$

$y = 25 - \frac{1}{2}(20)$

$y = 15\text{mi}$

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

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

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

$(8)(16) + (15)(-20) = 17\frac{dz}{dt}$

$128 - 300 = 17\frac{dz}{dt}$

$-172 = 17\frac{dz}{dt}$

$8^2 + 15^2 = z^2$

$64 + 225 = z^2$

$z^2 = 289$

$z = 17, \cancel{-17}$

$\frac{dz}{dt} = -\frac{172}{17}\text{ mph}$

Assignment:

Related Rates Review

#1-5