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.

p.194 #1-4

1) $\frac{dy}{dt} = -\frac{3\sqrt{21}}{2}\frac{ft}{\sec}$

2) $\frac{dA}{dt} = \frac{\pi}{40}\frac{cm^2}{\min}$ $= 0.025\pi$ $= \frac{25\pi}{1000} = \frac{\pi}{40}$

3) $\frac{dr}{dt} = \frac{20}{9\pi}\frac{ft}{\min}$

4) $\frac{dz}{dt} = \frac{66\sqrt{29}}{29}\frac{ft}{\sec}$

Air is being pumped into a spherical balloon at a rate of 5 cm^3/min. Determine the rate at which the radius of the balloon is increasing when the diameter of the balloon is 20 cm.

$\frac{dV}{dt} = 5 cm^3/min$

$\frac{dr}{dt} = ?$ when $d = 20cm$

$r = 10cm$

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

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

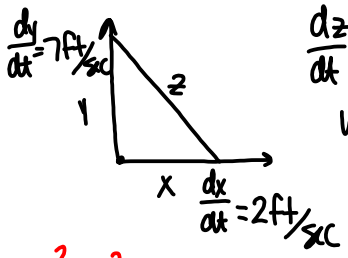
$5 = 4\pi(10)^2 \frac{dr}{dt}$

$5 = 400\pi \frac{dr}{dt}$

$\frac{dr}{dt} = \frac{5}{400\pi}$

$\frac{dr}{dt} = \frac{1}{80\pi}$ cm/min

Two people are at an elevator. At the same time, one person starts to walk away from the elevator at a rate of 2 ft/sec and the other person starts going up in the elevator at a rate of 7 ft/sec. What rate is the distance between the two people changing 15 seconds later?



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

when $t = 15 sec$

$x = 15(2) = 30 ft$

$y = 15(7) = 105 ft$

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

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

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

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

$30^2 + 105^2 = z^2$

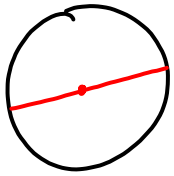
$900 + 11025 = z^2$

$z^2 = 11925$

$z = 15\sqrt{53}, -15\sqrt{53}$

$(30)(2) + (105)(7) = (15\sqrt{53})\frac{dz}{dt}$

$\frac{dz}{dt} = \sqrt{53}$ ft/sec



$\frac{dd}{dt} = 0.01 \text{ cm/min}$ $\frac{dr}{dt} = 0.005 \text{ cm/min}$

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

$A = \pi r^2$

when $d = 5\text{cm}$

$r = \frac{5}{2}\text{cm}$

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

$A = \pi\left(\frac{1}{2}d\right)^2$

$A = \frac{1}{4}\pi d^2$

$\frac{dA}{dt} = 2\pi\left(\frac{5}{2}\right)(.005)$

$\frac{dA}{dt} = \frac{1}{2}\pi d \frac{dd}{dt}$

$\frac{dA}{dt} = 5\pi\left(\frac{5}{1000}\right)$

$= \frac{25\pi}{1000}$

$\frac{dA}{dt} = \frac{\pi}{40} \text{ cm}^2/\text{min}$

$\frac{dA}{dt} = \frac{1}{2}\pi(5)\left(\frac{1}{100}\right)$

$\frac{dA}{dt} = \frac{\pi}{40} \text{ cm}^2/\text{min}$

$\frac{dV}{dt} = 5 \text{ ft}^3/\text{min}$

$\frac{dr}{dt} = ?$ when $d = 18 \text{ in}$

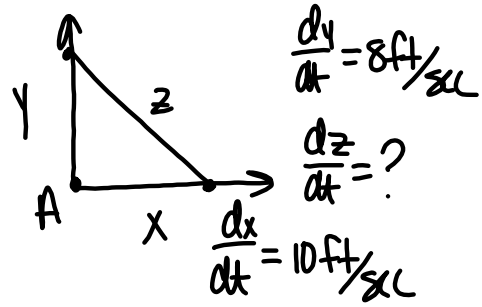
$r = 9 \text{ in} = \frac{3}{4} \text{ ft}$

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

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

$5 = 4\pi\left(\frac{3}{4}\right)\frac{dr}{dt}$

$\frac{dr}{dt} = \frac{20}{9\pi} \text{ ft/min}$



$\frac{dy}{dt} = 8 ft/sec$

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

$\frac{dx}{dt} = 10 ft/sec$

1st girl: 2 min
$120(10) = 1200 ft$

2nd girl: 1 min
$60(8) = 480 ft$

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

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

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

$(1200)^2 + (480)^2 = z^2$

$z = 240\sqrt{29}, -240\sqrt{29}$

$2(1200)(10) + 2(480)(8) = 2(240\sqrt{29})\frac{dz}{dt}$

$\frac{dz}{dt} = \frac{66\sqrt{29}}{29} ft/sec$

Assignment:

p.194 #11,12,16,19,21,22,26