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 #11,12,16,19,21,22,26

$$11)\ \frac{dV}{dt} = 5\frac{in^3}{\min}$$

$$12)\ \frac{dV}{dt} = -\frac{320\pi}{9}\frac{in^3}{\min}$$

$$16)\ \frac{dy}{dt} = \frac{1}{4}$$

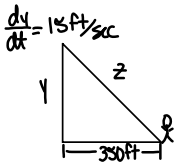
$$19)\ \frac{dC}{dt} = \pi\frac{m}{\sec}$$

$$21)\ \frac{dR}{dt} = \frac{11}{1600}\frac{ohms}{\sec}$$

$$22)\ \frac{dV}{dt} = -\frac{45}{14}\frac{cm^3}{\sec}$$

$$26)\ \frac{dV}{dt} = \frac{21\pi}{160}\frac{cm^3}{\min}$$

A person is standing 350 feet away from a model rocket that is fired straight up into the air at a rate of 15 ft/sec. At what rate is the distance between the person and the rocket increasing 20 seconds after liftoff?



$\frac{dy}{dt} = 15 ft/sec$

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

when $t = 20$ sec

$y = 15(20) = 300$ ft

$350^2 + y^2 = z^2$

$350^2 + 300^2 = z^2$

$0 + 2y\frac{dy}{dt} = 2z\frac{dz}{dt}$

$122500 + 90000 = z^2$

$y\frac{dy}{dt} = z\frac{dz}{dt}$

$z^2 = 212500$

$z = 50\sqrt{85}, -50\sqrt{85}$

$300(15) = 50\sqrt{85}\frac{dz}{dt}$

$4500 = 50\sqrt{85}\frac{dz}{dt}$

$\frac{4500}{50\sqrt{85}} = \frac{dz}{dt}$

$\frac{dz}{dt} = \frac{90}{\sqrt{85}} \cdot \frac{\sqrt{85}}{\sqrt{85}}$

$\frac{dz}{dt} = \frac{90\sqrt{85}}{85}$

$\frac{dz}{dt} = \frac{18\sqrt{85}}{17}$ ft/sec

A tank of water in the shape of a cone is being filled up with water at a rate of 12 m^3/sec. The base radius of the tank is 26 meters and the height of the tank is 8 meters. At what rate is the depth of the water changing when the radius of the top of the water is 10 meters?

$\frac{dV}{dt} = 12 m^3/sec$

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

when $r = 10$m

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

$\frac{26}{8} = \frac{r}{h}$

$8r = 26h$

$r = \frac{13}{4}h$

$10 = \frac{13}{4}h$

$40 = 13h$

$h = \frac{40}{13}$

$V = \frac{1}{3}\pi\left(\frac{13}{4}h\right)^2 h$

$V = \frac{1}{3}\pi\left(\frac{169}{16}h^2\right)h$

$V = \frac{169}{48}\pi h^3$

$\frac{dV}{dt} = \frac{169}{16}\pi h^2 \frac{dh}{dt}$

$12 = \frac{169}{16}\pi\left(\frac{40}{13}\right)^2 \frac{dh}{dt}$

$12 = \frac{169}{16}\pi\left(\frac{1600}{169}\right)\frac{dh}{dt}$

$12 = 100\pi\frac{dh}{dt}$

$\frac{dh}{dt} = \frac{12}{100\pi}$

$\frac{dh}{dt} = \frac{3}{25\pi}$ m/sec

22) $PV^{1.4} = C$ $P = 40$ dynes/cm^2

$\frac{dP}{dt} V^{1.4} + 1.4V^{.4} P \frac{dV}{dt} = 0$ $\boxed{\frac{dP}{dt} = 3}$ dynes/cm^2

$3(60)^{1.4} + 1.4(60)^{.4}(40)\frac{dV}{dt} = 0$ $V = 60\text{cm}^3$

$60^{.4}\left[3(60) + 1.4(40)\frac{dV}{dt}\right] = 0$ $\frac{dV}{dt} = ?$

$180 + 56\frac{dV}{dt} = 0$

$56\frac{dV}{dt} = -180$

$\frac{dV}{dt} = \frac{-45}{14}$ cm^3/sec

Assignment:

Related Rates

#1-4