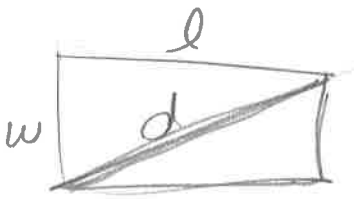
5.6 day 2 HW
calc BC

8. $A = \pi r^2$ $\quad \frac{dr}{dt} = 0.01$ cm/sec

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

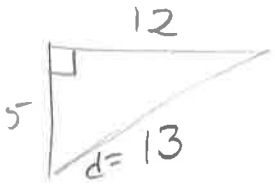
$= 100\pi (.01)$

9.



$\frac{dl}{dt} = -2$ cm/sec $\quad l = 12$

$\frac{dw}{dt} = 2$ cm/sec $\quad w = 5$



$w\frac{dw}{dt} + l\frac{dl}{dt} = d\frac{dd}{dt}$

$5(2) + 12(-2) = 13\frac{dd}{dt}$

$-14 = 13\frac{dd}{dt}$

$\frac{dd}{dt} = -14/13$ cm/sec

12. $V = \frac{4}{3}\pi r^3$ $\quad S = 4\pi r^2$ (surface area)

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

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

16. $\frac{dV}{dt} = 10\,m^3/min$

★ no similarity

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

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

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

$h = \frac{3}{8}d$

$h = \frac{3}{8}(2r)$

$h = \frac{3}{4}r$

moment

$h = 4\,m$

need cm

$4 = \frac{3}{4}r$

$r = 16/3$

$\frac{dV}{dt} = \frac{3}{4}\pi r^2 \frac{dr}{dt}$

$10 = \frac{3}{4}\pi \left(\frac{16}{3}\right)^2 \frac{dr}{dt}$

$10 = \frac{3}{4}\pi \frac{256}{9} \frac{dr}{dt}$

$10 = \frac{64}{3}\pi \frac{dr}{dt}$

$\frac{30}{64\pi} = \frac{dr}{dt}$

$\frac{dr}{dt} = .1492\,m/sec$

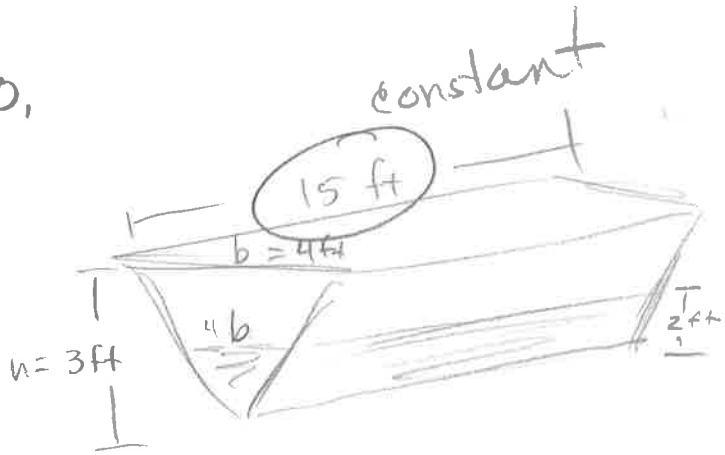
$\frac{dr}{dt} = 14.92\,cm/sec$

now... $h = \frac{3}{4}r$

$\frac{dh}{dt} = \frac{3}{4}\frac{dr}{dt}$

$\frac{dh}{dt} = 11.191\,cm/sec$

20.



B = area of base

$= \frac{1}{2}bh$

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

$\frac{dV}{dt} = 2.5\ ft^3/min$

$V = Bh$

$\frac{b}{h} = \frac{4}{3}$

$b = \frac{4}{3}h$

$V = \frac{2}{3}h^2 \cdot (15)$

$V = 10h^2$

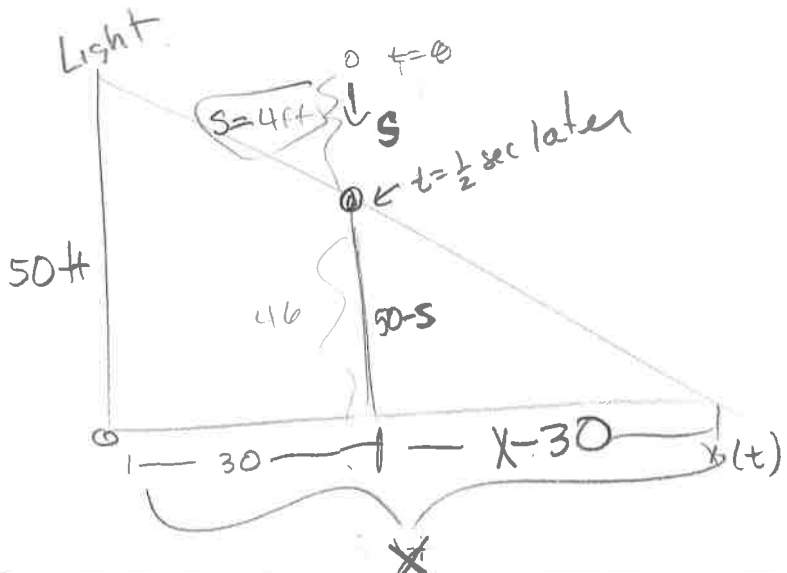
$\frac{dV}{dt} = 20h\frac{dh}{dt}$

$2.5 = 20(2)\frac{dh}{dt}$

$\frac{2.5}{40} = \frac{dh}{dt}$

$.0625\ ft/min = \frac{dh}{dt}$

30.



- similar triangles
- $s = 16t^2 = 16(\frac{1}{2})^2 = 4$

$\frac{ds}{dt} = 32t$ @ $t = 1/2 = 16\ ft/sec$

$\frac{50}{x} = \frac{50-s}{x-30}$

$50(x-30) = 50x - sx$

$50x - 1500 = 50x - sx$

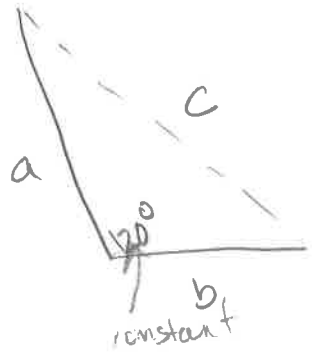
$-1500 = -sx$

$x = \frac{1500}{s}$

$\frac{dx}{dt} = \frac{-1500}{s^2}\frac{ds}{dt}$

$\frac{dx}{dt} = \frac{-1500}{(4)^2}(64) = -1500\ ft/sec$

35.



$\frac{da}{dt} = 14$ knots $\quad \frac{db}{dt} = 21$ knots

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

Law of cosines

$c^2 = a^2 + b^2 - 2ab\cos 120^\circ$

$c^2 = a^2 + b^2 - 2ab(-\frac{1}{2})$

$c^2 = a^2 + b^2 + ab$

moment:

$2c\frac{dc}{dt} = 2a\frac{da}{dt} + 2b\frac{db}{dt} + a\frac{db}{dt} + b\frac{da}{dt}$

$2(7)\frac{dc}{dt} = 2(5)(14) + 2(3)(21) + 5(21) + 3(14)$

$\frac{dc}{dt} = 29.5$ knots

moment

$c^2 = 5^2 + 3^2 + 5(3)$

$c^2 = 25 + 9 + 15$

$c^2 = 49$

$c = 7$

41. $V = \pi r^2 l$

$\frac{dV}{dt} = 2\pi r l \frac{dr}{dt} + \pi r^2 \frac{dl}{dt}$

constant

$0 = 2\pi(1)(100)\frac{dr}{dt} + \pi(1)2$

$\frac{dr}{dt} = \frac{-2\pi}{200\pi} = -.01$ cm/s