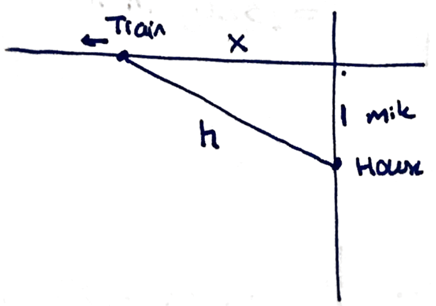
1



Relation:

$x^2+1=h^2$

Differentiated:

$2x\cdot x' = 2h\cdot h'$

Given info. (at key moment):

$x' = \underline{40}$ (mph)

$x = 40\text{mph}\cdot 6\text{min}$

$= 40\frac{m}{hr}\cdot\frac{1}{10}hr = \underline{4}\ m$

$\Rightarrow h=\sqrt{1+x^2}= \sqrt{1+4^2} = \sqrt{17}$

substituting $x'=40$, $x=4$, $h=\sqrt{17}$ gives

$2\cdot 4\cdot 40 = 2\sqrt{17}\cdot h'$

$\Rightarrow h' = \frac{\cancel{2}\cdot 4\cdot 40}{\cancel{2}\cdot\sqrt{17}} = \boxed{\frac{160}{\sqrt{17}}}$ (mph) (≈ 38.8mph)

2

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

$V' = \frac{4}{3}\cdot\pi\cdot 3r^2\cdot r'$

$V' = \cancel{4}\ 4\pi r^2\cdot r'$

At this moment:

$r=2$

$\Rightarrow V = \cancel{8\pi}\ \frac{32}{3}\pi$

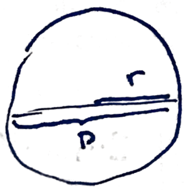
$r'=-1$

sub.:

$V' = 4\pi\cdot 2^2\cdot(-1)$

$= \boxed{-16\pi}$ ~~m~~ in^3/m

3



$A=\pi r^2$

$A' = 2\pi r\cdot r'$

Given:

$r=10$ (diam 20)

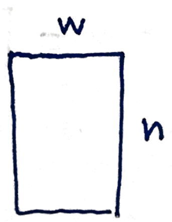
$A' = 100\ ft^2/min$

sub:

$100 = 2\pi\cdot 10\cdot r'$

$r' = \frac{100}{20\pi} = \boxed{\frac{5}{\pi}}$ ft/min.

4



$A = w\cdot h$

$A' = w'h + wh'$

Given

$w'=2$ $w=6$

$h'=-3$ $h=8$

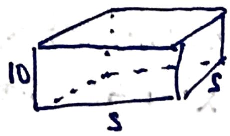
sub.

$A' = 2\cdot 8 - 6\cdot 3$

$= \cancel{2}16 - 18$

$= \boxed{-2}$ $in^2/sec.$

5



$V = 10s^2$

$V' = 20s \cdot s'$

Given

$s = 8$

$s' = 2$

$V' = 20 \cdot 8 \cdot 2$

$= \boxed{320}$ in³/min.

6

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

when $\frac{h}{r} = \frac{12}{\cancel{6}7} = \cancel{2}$

ie. $h = \frac{12}{7} r$

$V = \frac{1}{3}\pi r^2 \cdot \frac{12}{7} r$

$V = \frac{4}{7}\pi r^3$

$V' = \frac{12}{7}\pi r^2 \cdot r'$

$r' = -2$

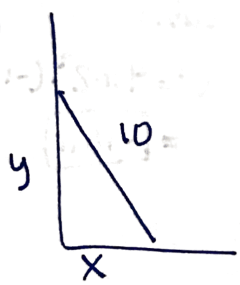
$r = 2$

$V' = \frac{12}{7}\pi \cdot 2^2 \cdot (-2)$

$= \frac{12}{7}\pi \cdot (-8)$

$= \boxed{-\frac{96}{7}\pi}$ ft³/min

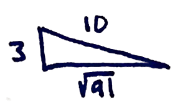
7



$x^2 + y^2 = 10^2$

$2x \cdot x' + 2y \cdot y' = 0$

key moment:



$y' = -1$

$y = 3$

$\Rightarrow \cancel{x = 4}$

$x = \sqrt{91}$

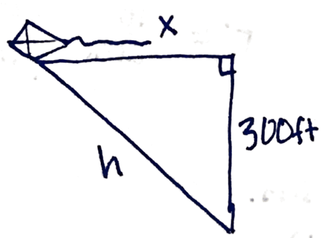
$2 \cdot \overset{\sqrt{91}}{\cancel{4}} \cdot x' + 2 \cdot 3 \cdot (-1) = 0$

$2\sqrt{91}\,\cancel{8}\,x' = 6$

~~$x' = 3/4$ ft/sec.~~

$x' = \frac{3}{\sqrt{91}}$ ft/sec.

8



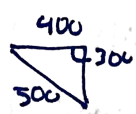
$x^2 + 300^2 = h^2$

$2x \cdot x' = 2h \cdot h'$

$x' = 10$

$x = 10 \frac{ft}{sec} \cdot 40 sec = 400$

$\Rightarrow h = 500$



$\cancel{2} \cdot 400 \cdot 10 = \cancel{2} \cdot 500 \cdot h'$

$h' = \frac{400}{500} \cdot 10$

$= \boxed{8}$ ft/sec.