6.2 Answers

For step-by-step solutions, check out the video “walkthrough” on the website for 6.2

1. 54	2. -45
3. $\frac{11}{2}$	4. $-\frac{9}{2}$
5. $-\frac{5}{27}$ cm/hour	6. 2 in / sec
7. 180π in^2 / sec	8. $\dfrac{-3000}{\sqrt{74}}$ mph
9. $\frac{45}{8}$ feet / sec	10. $\frac{3}{200}$ radians / sec
11. $\frac{25}{6}$ feet/sec	12. $-\frac{12}{5}$ feet/sec
13. 57.6 meters/sec	14. $h < 1.5$

Free Response Scoring Guide

Use this only AFTER you have attempted the problem on your own.

Solutions	Points
(a) When $h = 5$, $r = \frac{5}{2}$; $V(5) = \frac{1}{3}\pi\left(\frac{5}{2}\right)^2 5 = \frac{125}{12}\pi \text{ cm}^3$	1 : V when $h = 5$
(b) $\frac{r}{h} = \frac{5}{10}$, so $r = \frac{1}{2}h$ $V = \frac{1}{3}\pi\left(\frac{1}{4}h^2\right)h = \frac{1}{12}\pi h^3$; $\frac{dV}{dt} = \frac{1}{4}\pi h^2 \frac{dh}{dt}$ $\left.\frac{dV}{dt}\right\vert_{h=5} = \frac{1}{4}\pi(25)\left(-\frac{3}{10}\right) = -\frac{15}{8}\pi \text{ cm}^3/\text{hr}$ OR $\frac{dV}{dt} = \frac{1}{3}\pi\left(r^2\frac{dh}{dt} + 2rh\frac{dr}{dt}\right)$; $\frac{dr}{dt} = \frac{1}{2}\frac{dh}{dt}$ $\left.\frac{dV}{dt}\right\vert_{h=5,r=\frac{5}{2}} = \frac{1}{3}\pi\left(\left(\frac{25}{4}\right)\left(-\frac{3}{10}\right) + 2\left(\frac{5}{2}\right)5\left(-\frac{3}{20}\right)\right)$ $= -\frac{15}{8}\pi \text{ cm}^3/\text{hr}$	5 $\begin{cases} 1: r = \frac{1}{2}h \text{ in (a) or (b)} \\ 1: \begin{cases} V \text{ as a function of one variable in (a) or (b)} \\ \text{OR} \\ \frac{dr}{dt} \end{cases} \\ 2: \frac{dV}{dt} \\ \quad <-2> \text{ chain rule or product rule error} \\ 1: \text{evaluation at } h = 5 \end{cases}$
(c) $\frac{dV}{dt} = \frac{1}{4}\pi h^2\frac{dh}{dt} = -\frac{3}{40}\pi h^2$ $= -\frac{3}{40}\pi(2r)^2 = -\frac{3}{10}\pi r^2 = -\frac{3}{10}\cdot$ area The constant of proportionality is $-\frac{3}{10}$.	2 $\begin{cases} 1: \text{shows } \frac{dV}{dt} = k \cdot \text{area} \\ 1: \text{identifies constant of proportionality} \end{cases}$
units of cm^3 in (a) and cm^3/hr in (b)	**1 : correct units in (a) and (b)**