

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. $\frac{-3000}{\sqrt{74}}$ 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.

<u>Solutions</u>	<u>Points</u>
<p>(a) When $h = 5$, $r = \frac{5}{2}$; $V(5) = \frac{1}{3}\pi\left(\frac{5}{2}\right)^2 5 = \frac{125}{12}\pi$ cm³</p> <p>(b) $\frac{r}{h} = \frac{5}{10}$, so $r = \frac{1}{2}h$ $V = \frac{1}{3}\pi\left(\frac{1}{4}h^2\right)h = \frac{1}{12}\pi h^3$; $\frac{dV}{dt} = \frac{1}{4}\pi h^2 \frac{dh}{dt}$ $\frac{dV}{dt}\Big _{h=5} = \frac{1}{4}\pi(25)\left(-\frac{3}{10}\right) = -\frac{15}{8}\pi$ cm³/hr</p> <p style="text-align: center;">OR</p> $\frac{dV}{dt} = \frac{1}{3}\pi\left(r^2 \frac{dh}{dt} + 2rh \frac{dr}{dt}\right); \frac{dr}{dt} = \frac{1}{2} \frac{dh}{dt}$ $\frac{dV}{dt}\Big _{h=5, r=\frac{5}{2}} = \frac{1}{3}\pi\left(\left(\frac{25}{4}\right)\left(-\frac{3}{10}\right) + 2\left(\frac{5}{2}\right)5\left(-\frac{3}{20}\right)\right)$ $= -\frac{15}{8}\pi$ cm ³ /hr <p>(c) $\frac{dV}{dt} = \frac{1}{4}\pi h^2 \frac{dh}{dt} = -\frac{3}{40}\pi h^2$ $= -\frac{3}{40}\pi(2r)^2 = -\frac{3}{10}\pi r^2 = -\frac{3}{10} \cdot \text{area}$ The constant of proportionality is $-\frac{3}{10}$.</p>	<p>1 : V when $h = 5$</p> <p>1 : $r = \frac{1}{2}h$ in (a) or (b)</p> <p>1 : V as a function of one variable in (a) or (b)</p> <p>OR</p> <p>5 : $\frac{dr}{dt}$</p> <p>2 : $\frac{dV}{dt}$ < -2 > chain rule or product rule error</p> <p>1 : evaluation at $h = 5$</p> <p>1 : shows $\frac{dV}{dt} = k \cdot \text{area}$</p> <p>2 : 1 : identifies constant of proportionality</p>
units of cm ³ in (a) and cm ³ /hr in (b)	1 : correct units in (a) and (b)