Warm Up

The volume, V, of a spherical balloon in cubic centimetres, t hours after it is inflated, is given by the formula...

$$V = \frac{4}{3}\pi(9-2t)^3 \quad t < 4.5h$$

Restriction $0 \leq t < 4.5h$

(a) Determine the average rate of change between $t = 1.2$ hours and $t = 4.1$ hours.

X	Y_1
1.2	1204.3
4.1	2.1447

X=

$$ARC = \frac{1204.3 - 2.14 \text{ cm}^3}{1.2 - 4.1 \text{ h}}$$

$$= -414.5 \text{ cm}^3/\text{h}$$

(b) Determine the instantaneous rate of change in the volume after 3 hours and 15 minutes.

3.25h

X	Y_1
3.26	63.892
3.24	67.033

X=

$$IRC = \frac{63.892 - 67.033 \text{ cm}^3}{3.26 - 3.24 \text{ h}}$$

$$= -157.05 \text{ cm}^3/\text{h}$$

X=3.25
Y=-157.07966619X+575.95_

$y = mx + b$

IRC

(c) Why is there a restriction on the value of t ?

→ Volume MUST be a (+) Quantity

(d) Estimate when the volume is changing at a rate of -1230 cm^3/hr

≈ 1 sec thanks to TI-84

7. a) 27, 17, 7, -3

Quad. -10, -10, -10

$y = ax^2 + bx + c$

$(0,1) \to 1 = 0 + 0 + c$

$c = 1$

$(1,28) \to 28 = a(1)^2 + b(1) + 1 \Rightarrow a + b = 27$

$(2,45) \to 45 = a(4) + b(2) + 1 \Rightarrow \begin{cases} 4a + 2b = 44 \\ 2a + 2b = 54 \end{cases}$

$2a = -10$

$a = -5$

$-5 + b = 27$

$b = 32$

$h = -5t^2 + 32t + 1$

b) $h = -5\left(t^2 - \frac{32}{5}t + \frac{256}{25}\right) + 1 + \frac{256}{5}$

$h = -5\left(t - \frac{16}{5}\right)^2 + \frac{261}{5}$

$-\frac{1}{5}\left(h - \frac{261}{5}\right) = \left(t - \frac{16}{5}\right)^2 \Rightarrow V\left(\frac{16}{5}, \frac{261}{5}\right)$

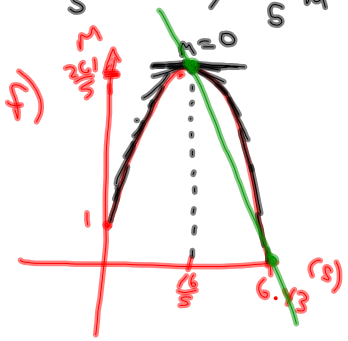
(s, m)

c) $\frac{16}{5}$ sec d) $\frac{261}{5}$ m e) $-5t^2 + 32t + 1 = 0$

$t = \frac{-32 \pm \sqrt{(32)^2 - 4(-5)(1)}}{-10}$

$t = 6.43$ s; some (-) #

f)



g) $\left(\frac{16}{5}, \frac{261}{5}\right)$ s, $\left(6.43, 0\right)$ s

(s, m) (s, m)

$ARC = \frac{52.2 - 0}{3.2 - 6.43}\ \frac{m}{sec}$

$= -16.16\ m/s$

h) $t = 2$ sec

t	h
1.9	
2.1	

$IRC = 12\ m/s$

Activity

Mr lams data.84state

Mr. Lam has found himself in trouble with the law...
he needs your help to defend his case!!

Complete Investigation 2: Page 85

- Do steps A - E (Use TI-83 to plot data)
- Complete questions 1 - 8 at end of investigation

When completed return to page 85 and do the "Challenge Yourself" question

Attachments

Mr lams data.84state