Even answers pp 252-3

#24 (a) -46 cm/s

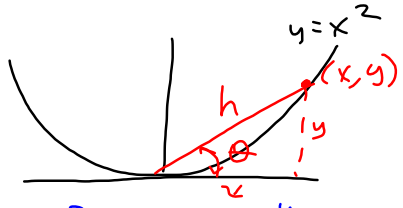
(b) 2 cm/s

(c) -88 cm/s

#26 $\frac{2}{5}$ rad/s

#28 -5 m/s

#25



$\frac{dx}{dt} = 10$ m/s

Want $\frac{d\theta}{dt}$ when $x=3$

$y = x^2$

$\frac{dy}{dt} = 2x\frac{dx}{dt}$

$\frac{dy}{dt} = 6 \cdot 10 = 60$

$h = \sqrt{9+81}$

$= \sqrt{90}$

$\tan\theta = \frac{y}{x}$

$\sec^2\theta \frac{d\theta}{dt} = \frac{x\frac{dy}{dt} - y\frac{dx}{dt}}{x^2}$

$\sec^2\theta \frac{d\theta}{dt} = \frac{3\frac{dy}{dt} - 10y}{9}$

$= \frac{180 - 10\cdot 9}{9}$

$\sec^2\theta \frac{d\theta}{dt} = 10$

$\sec\theta = \frac{\sqrt{90}}{3}$

$\sec^2\theta = \frac{90}{9} = 10$

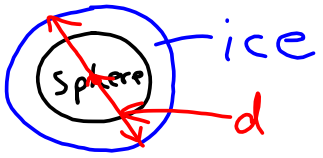
$\rightarrow 10\frac{d\theta}{dt} = 10$

$\frac{d\theta}{dt} = 1$ rad/s

#27 $\frac{dV}{dt} = -8$ ml/min

Want: $\frac{dS}{dt}$

when $d = 20$ cm



$V = \frac{4}{3}\pi r^3$ $\quad S = 4\pi r^2$

$\frac{dV}{dt} = \frac{12}{3}\pi r^2 \frac{dr}{dt}$ $\quad \frac{dS}{dt} = 8\pi r \frac{dr}{dt}$

$= 4\pi r^2 \frac{dr}{dt}$ $\quad \frac{dS}{dt} = 8\pi \cdot 10 \cdot \frac{dr}{dt}$

$= \frac{80\pi}{50\pi} = -\frac{8}{5}$ cm²/min

$-8 = 4\pi \cdot 100 \cdot \frac{dr}{dt}$

$\frac{dr}{dt} = \frac{-1}{50\pi}$ $\quad$ Ans: $\frac{8}{5}$ cm²/min

Topic: pay attention to how a question is phrased, e.g.

#19 (a) "how fast is the top of the ladder sliding down the wall"

Ans: 12

vs. hypothetical:

(a) "what is the rate of change of position of top of the ladder on the wall"

Ans: -12