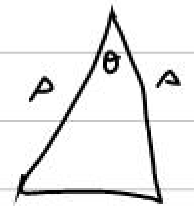
28 Sept 2009

p. 154 17)



$A = \frac{1}{2} s h$

$\sin\theta = \frac{h}{s}$

$s \sin\theta = h$

$\text{Area} = \frac{1}{2} s^2 \sin\theta$

a) $\frac{d\theta}{dt} = \frac{1}{2}$

$A = \frac{1}{2} s^2 \sin\theta$

$\frac{dA}{dt} = \frac{1}{2} s^2 \cos\theta \frac{d\theta}{dt}$

$\frac{1}{4} s^2 \cos\theta$

$\left.\frac{dA}{dt}\right|_{\theta=\pi/6} = \frac{1}{4} s^2 \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{8} s^2 \ \frac{u^2}{\text{sec}}$

$\left.\frac{dA}{dt}\right|_{\theta=\pi/3} = \frac{1}{4} s^2 \frac{1}{2} = \frac{1}{8} s^2 \ \frac{\text{units}^2}{\text{sec}}$

---

a) $\frac{dx}{dt} < 0$

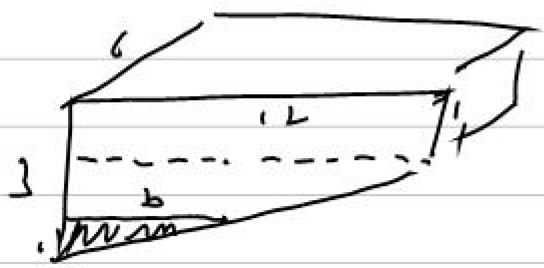
$y = f(x)$

$\frac{dy}{dt} = f'(x) \frac{dx}{dt}$

$f'(x) < 0 \quad \frac{dx}{dt} < 0$

$\therefore \frac{dy}{dt} > 0$

251



$\frac{dv}{dt} = \frac{1}{4}$ m^3/min

$\frac{b}{1} = \frac{12}{2}$

$\frac{\cancel{\frac{1}{2}}(1)\cancel{(6)}\cancel{6}}{\cancel{\frac{1}{2}}\cancel{(6)}(3\cdot 1)6} = \frac{1}{8} = 12.5\%$

2

$\frac{b}{h} = \frac{12}{2}$

$b = 6h$

$V = \frac{1}{2} h b (6) = 3hb$

$V = 18h^2$

$\frac{dv}{dt} = 36h \frac{dh}{dt}$

$\frac{1}{4} \cdot \frac{1}{36(1)} = \frac{dh}{dt}$ $\qquad \frac{1}{144}$ met/min

---

Continued from finding

$\frac{dv}{dt} = 10$ $\qquad$ h 6 = dim, $\qquad \left.\frac{dh}{dt}\right|_{h=3} = ?$

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

$V = \frac{1}{3}\pi\left(\frac{h}{2}\right)^2 h$ $\qquad \frac{h}{2} = r$

$V = \frac{h^3 \pi}{12}$ $\qquad \frac{dv}{dt} = \frac{h^2\pi}{4}\frac{dh}{dt}$

$\frac{40}{9\pi}$ ft/min $\qquad \frac{(10)4}{9\pi} = \frac{dh}{dt}$

$$f(x) = x^3 - 3x^2 - 4x + 12 \qquad h(x) = \begin{cases} \frac{f(x)}{x-3} & x \neq 3 \\ p & x = 3 \end{cases}$$

$$x^3 - 3x^2 - 4x + 12 = 0$$
$$x^2(x-3) - 4(x-3) = 0$$
$$(x-3)(x^2-4) = 0$$

zeros of f 3, 2, -2.

$$h(x) = \begin{cases} \frac{(x-3)(x^2-4)}{x-3} & x \neq 3 \\ p & x = 3 \end{cases}$$

$$h(3) = p \qquad \lim_{x \to 3} h(x) = \lim_{x \to 3} \frac{\cancel{(x-3)}(x^2-4)}{\cancel{x-3}} = 5$$

$\therefore$ if $p = 5$ h is cont. at $x = 3$

Since $h(3)$ exists, $\lim_{x \to 3} h(x)$ exists

and $\lim_{x \to 3} h(x) = h(3)$

$h(x) = x^2 - 4$ if $x \neq 3$

$h(-x) = (-x)^2 - 4 = x^2 - 4 = h(x)$ for all $x \neq 3$

$h(-3) = (-3)^2 - 4 = 5$

$h(3) = 5 \qquad \therefore h(-x) = h(x)$ for all x

$\therefore$ h is even