HW

$\boxed{\text{DAY 68}}$ § 4.3 p210-215 # 2, 3, 6, 9

(2) $(x)(y) = 784$

$y = \dfrac{784}{x}$

x & y are positive.

MINIMIZE: $x + y = \text{sum}$

$\text{sum} = x + \dfrac{784}{x}$

$\dfrac{dS}{dx} = 1 - \dfrac{784}{x^2} = \dfrac{x^2 - 784}{x^2}$

$\dfrac{dS}{dx} = \dfrac{(x-28)(x+28)}{x^2} = 0 \quad x = \pm 28$

und $\quad x = 0$

S': $+ \; 0 \; - \; \varnothing \; - \; 0 \; +$

$\nearrow -28 \searrow 0 \searrow 28 \nearrow$

min

Min. sum @ $x = 28$ b/c S' changes signs $-$ to $+$.

$\therefore \underline{x = 28} \quad \therefore y = \dfrac{784}{28} = \underline{28} \quad x + y = 56 = \text{sum}$

ATQ: Minimum value sum $= 56$.

(3) $x + y + z = 36$

& $y = 2x$

$\therefore x + 2x + z = 36$

$3x + z = 36$

$z = 36 - 3x$

MAXIMIZE $(x)(y)(z) = \text{product}$.

$(x)(2x)(36 - 3x) = \text{product}$

$(2x^2)(3)(12 - x) = \text{product}$

$(6x^2)(12 - x) = \text{product}$

$\dfrac{dp}{dx} = (12x)(12 - x) + (6x^2)(-1)$

$= 6x[2(12 - x) - x]$

$= 6x[24 - 3x]$

$= 18x[8 - x] = 0$

p': $- \; + \; 0 \; -$

$\searrow 0 \nearrow 8 \searrow$

$x = 8$

$y = 2(8) = 16$

$z = 36 - 3(8) = 12$

$\text{product} = (8)(16)(12)$

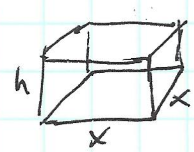
$= 1536$

$\dfrac{dP}{dx}$ changes signs $+$ to $-$ at $x = 8$

$\therefore x = 8$ maximizes product.

Maximum product $= 1536$

(6)



closed top.

Minimize surface area

$V = x \cdot x \cdot h = 8 \text{ cm}^3 \quad \therefore h = \dfrac{8}{x^2}$

$SA = 2x^2 + 4xh$

$SA = 2x^2 + 4x\left(\dfrac{8}{x^2}\right)$

$SA = 2x^2 + \dfrac{32}{x}$

$\dfrac{dS}{dx} = 4x - \dfrac{32}{x^2}$

$\dfrac{ds}{dx} = \dfrac{4x^3 - 32}{x^2} = \dfrac{4(x^3 - 8)}{x^2} = \dfrac{4(x-2)(x^2 + 2x + 4)}{x^2} \begin{array}{l} = 0 \\ = \text{und} \end{array} \quad \begin{array}{l} x = 2 \\ x = 0 \end{array}$

S': $- \; \varnothing \; - \; 0 \; +$

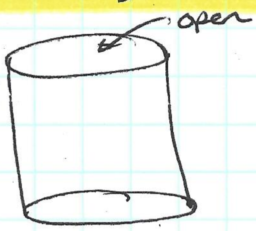
$0 \searrow 2 \nearrow$

When $x = 2$ & $h = 2$ SA is minimized $= 24 \text{ cm}^2$

b/c $\dfrac{ds}{dx}$ changes signs $-$ to $+$

HW $\boxed{\text{DAY 68}}$ §4.3 p. 210 #9

9



$V = \pi r^2 h = 8\,cm^3$

$h = \dfrac{8}{\pi r^2}$

$SA = \pi r^2 + 2\pi r h$

$SA = \pi r^2 + \dfrac{16}{r}$

$\dfrac{ds}{dr} = 2\pi r + \dfrac{-16}{r^2}$

$\dfrac{ds}{dr} = \dfrac{2\pi r^3 - 16}{r^2} = \dfrac{2(\pi r^3 - 8)}{r^2}$

$\pi r^3 - 8 = 0$ und : $r = 0$

$r = \sqrt[3]{\dfrac{8}{\pi}}$

$\dfrac{ds}{dx}$ — $\cancel{0}$ — 0 +

↘ 0 → $\sqrt[3]{\frac{8}{\pi}}$ ↗

SA is minimize when $r = \sqrt[3]{\frac{8}{\pi}} \approx$ 1.365 cm
1.366

SA = cm^2

b/c $\dfrac{ds}{dx}$ changes sign ⊖ to ⊕ @ $x = \sqrt{\frac{8}{\pi}}$.

$r = \sqrt[3]{\dfrac{8}{\pi}}$

$r = 1.365$
1.366 cm

$h = \dfrac{8}{\pi r^2} = 1.365$ cm or 1.366 cm

$SA = \pi r^2 + \dfrac{16}{r} = 17.575\ cm^2$