Section 3.7

(25) $V = 12\ fl.oz.$

$1\ fl.oz = 1.804696\ in^3$

$V = 21.65628\ in^3$

$21.65628 = \pi r^2 h$

$\frac{21.65628}{\pi r^2} = h$

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

$Cost = 2(2\pi r^2) + 2\pi rh$

$C(r) = 4\pi r^2 + 2\pi r\left(\frac{21.65628}{\pi r^2}\right)$

$C(r) = 4\pi r^2 + 43.31256 r^{-1}$

$C'(r) = 8\pi r - 43.31256 r^{-2}$

$C'(r) = \frac{8\pi r^3 - 43.31256}{r^2}$

$C'(r)$: $-$ on $(0, 1.1989)$, $+$ on $(1.1989, \infty)$ — min

$0 = 8\pi r^3 - 43.31256$

$\sqrt[3]{\frac{43.31256}{8\pi}} = r$

$1.1989 = r$

radius $\approx 1.1989\ in$

height $\approx 4.7759\ in$

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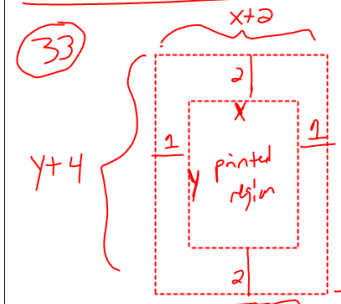
(33)



printed region $\sqrt{46}\ in \times 2\sqrt{46}\ in$

overall ad $\sqrt{46}+2\ in \times 2\sqrt{46}+4\ in$

Printed Area $= 92\ in^2 = xy$

$\frac{92}{x} = y$

$Total = (x+2)(y+4)$

$T(x) = (x+2)\left(\frac{92}{x}+4\right)$

$T'(x) = \left(\frac{92}{x}+4\right) + (x+2)(-92x^{-2})$

$\frac{92}{x} + \frac{4x^2}{x^2} - \frac{92}{x} - \frac{184}{x^2}$

$T'(x)$: $-$ on $(0, \sqrt{46})$, $+$ on $(\sqrt{46}, \infty)$ — min

$T'(x) = \frac{4x^2 - 184}{x^2}$

$4x^2 - 184 = 0$

$x^2 = 46$

crit #'s $\Rightarrow x = \pm\sqrt{46}$

$\frac{92\sqrt{46}}{46} = 2\sqrt{46}$

Section 3.8

$1\ ft^3 \approx 7.5\ gal$

$= 150\ gal/min$

$r(t) = 500\ ft$

$V = \pi r^2 h$

ex 1

$\leftarrow \frac{1}{10}'' = h$

$V = \frac{1}{120}\pi r^2$

$\frac{1}{10}'' \div 12 = \frac{1}{120}\ ft = h$

$V(t) = \frac{1}{120}\pi [r(t)]^2$

$V'(t) = 150\ gal/min$

$V'(t) = \frac{\pi}{120}(2)[r(t)]\, r'(t)$

$\frac{150\ gal}{1\ min} \left| \frac{1\ ft^3}{7.5\ gal} \right. = 20\ ft^3 \rightarrow$

$20 = \frac{\pi}{120}(2)(500)\, r'(t)$

$20 = \frac{1000\pi}{120} r'(t)$

$20 = \frac{\pi}{120}(2)(100) r'(t)$

$\frac{12\cancel{0}}{2\cancel{00}\pi}(2\cancel{0}) = r'(t)$

$3.82 = r'(t)$

$\left(\frac{12\cancel{0}}{100\cancel{0}\pi}\right) 2\cancel{0} = r'(t)$

$.764\ ft/mh = r'(t)$

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ex 2

$y'(t)$

$2\ ft/sec$

$x'(t)$

when vert. dist = 8 ft

$x^2 + y^2 = 10^2$

$[x(t)]^2 + [y(t)]^2 = 100$

$2[x(t)]\, x'(t) + 2[y(t)]\, y'(t) = 0$

$2(6)\, x'(t) + 2(8)(-2) = 0$

$x'(t) = \frac{32}{12}$

$x'(t) = \frac{8}{3}\ ft/sec$

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1, 5, 7, 9