$f(x) = \frac{x}{4+x}$; $[0, \boxed{100}]$

Find the absolute max / min.

(1) Critical Points. $f'(x) = \frac{1\cdot(4+x) - 1\cdot x}{(4+x)^2}$

$f'(x) = \frac{4+x-x}{(4+x)^2} = \frac{4}{(4+x)^2}$.

No critical point.

(2) $f(0) = \boxed{0}$; $f(100) = \boxed{\frac{100}{104}}$

abs. min abs. max

$(0,0)$ $(100, \frac{25}{26})$

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$f(x) = \frac{\boxed{x^2-1}}{\boxed{x^2+8x-9}}$ Domain: $x^2+8x-9=0$

$(x-1)(x+9)=0$; $x=1$; $x=-9$

Critical Points in the domain: Domain: $(-\infty,-9)\cup(-9,1)\cup(1,\infty)$

$f(x) = \frac{\cancel{(x-1)}(x+1)}{\cancel{(x-1)}(x+9)} = \frac{x+1}{x+9}$

$f'(x) = \frac{1\cdot(x+9) - (x+1)}{(x+9)^2} = \frac{\cancel{x}+9-\cancel{x}-1}{(x+9)^2}$

$= \frac{8}{(x+9)^2}$.

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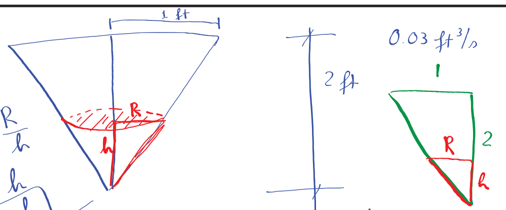

$\frac{1}{2} = \frac{R}{h}$

$2R = h$

$\boxed{R = \frac{h}{2}}$

(1) $\boxed{\text{Radius: } R}$ (2) $\frac{dV}{dt} = -0.03$.

Height : h $\frac{dh}{dt} = ?$

Volume : V

(3) $V = \frac{1}{3}\cdot(\text{base area})\cdot(\text{height})$

$\boxed{V = \frac{1}{3}\cdot\pi R^2\cdot h}$ Solve for R in terms of h

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$V = \frac{1}{3}\pi\left(\frac{h}{2}\right)^2\cdot h = \frac{1}{3}\pi\cdot\frac{h^2}{4}\cdot h = \frac{\pi}{12}h^3$

$\boxed{V = \frac{\pi}{12}\cdot h^3}$ $-0.03 = \frac{\pi}{12}\cdot 3\cdot\frac{1}{4}\cdot\frac{dh}{dt}$

$\boxed{\frac{dV}{dt}} = \frac{\pi}{12}\cdot 3\boxed{h}^2\cdot\boxed{\frac{dh}{dt}}$ $\frac{dh}{dt} = \boxed{\frac{-0.03}{\frac{\pi}{12}\cdot\frac{3}{4}}}$

-0.03 $\frac{1}{2}$

$\approx$

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$f(1) = 10$

$\boxed{f'(x) \geq 2 \text{ for every } x}$ with $1 \leq x \leq 4$

What is the smallest value of $\boxed{f(4)}$?

$[1,4]$ MVT :

there is a number c in $(1,4)$ such that

$f'(c) = \frac{f(4)-f(1)}{4-1}$

$\frac{f(4)-10}{3} = f'(c) \geq 2$

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$\frac{f(4)-10}{3} \geq 2$

$f(4) - 10 \geq 6$

$f(4) \geq 16$

$$\boxed{(f^{-1})'(x) = \frac{1}{f'(f^{-1}(x))}}$$

#7 $f(x) = x + \sin x = 0$

$f(0)=0$

f is one-to-one on $(-1,1)$ $f'(x) = \boxed{1+\cos x}$

$f^{-1}(0) = 0$

Find $(f^{-1})'(0) = \frac{1}{f'(f^{-1}(0))} = \frac{1}{f'(0)}$

$= \boxed{\frac{1}{2}}$

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