$\frac{d}{dt}\left(\tan\theta = \frac{h}{1000}\right)$

$\frac{dh}{dt}$

$$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{1000} \frac{dh}{dt}$$

$$1000 \sec^2 0.6 \left(4\pi\right) = \frac{dh}{dt}$$

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$y = \tan x + \cot x$

$\frac{dy}{dx} = \sec^2 x - \csc^2 x = 0$

$\sec^2 x = \csc^2 x$

$\frac{\pi}{4}, \frac{3\pi}{4}$

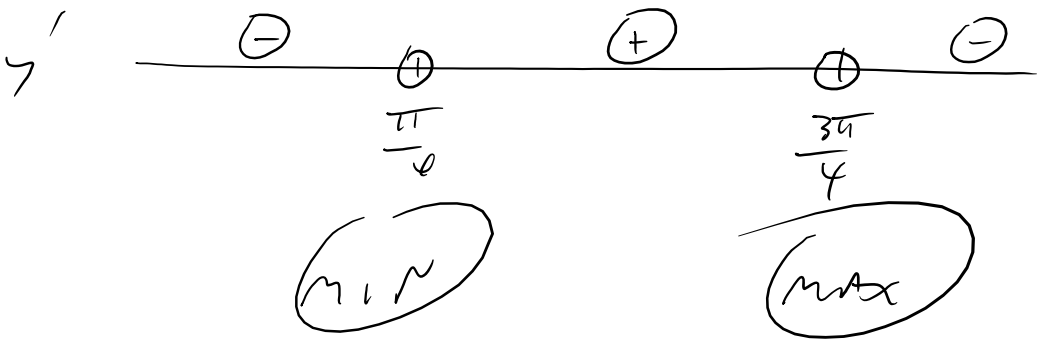
$\sec^2 \pi/3 \quad \csc^2 \pi/3$

$\frac{1}{(1/2)^2} - \frac{1}{(\sqrt{3}/2)^2} > 0$

$\sec^2 \frac{\pi}{6} - \csc^2 \frac{\pi}{6}$

$\frac{1}{(\sqrt{3}/2)^2} - \frac{1}{(\frac{1}{2})^2}$

$\frac{4}{3} - 4 < 0$



MIN

MAX

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$y = \sin^{-1} x$

Slope of secant line: $\dfrac{\sin^{-1} 0.5 - \sin^{-1} 0}{0.5 - 0}$

$\dfrac{\frac{\pi}{6} - 0}{\frac{1}{2}} = \dfrac{\pi}{3}$

$\dfrac{d}{dx} \sin^{-1} x = \dfrac{1}{\sqrt{1-x^2}}$

$\dfrac{1}{\sqrt{1-x^2}} = \dfrac{\pi}{3}$

$\sqrt{1-x^2} = \dfrac{3}{\pi}$

$1 - x^2 = \dfrac{9}{\pi^2}$

$x^2 = 1 - \dfrac{9}{\pi^2}$

$x = \sqrt{1 - \dfrac{9}{\pi^2}}$

(8) (a) $V = 12$ minimize surface area

$12 = V = x^2 y$ $\quad y = \frac{12}{x^2}$

$A = 2x^2 + 4xy$

$A = 2x^2 + 4x\left(\frac{12}{x^2}\right) = 2x + 48x^{-1}$

$\frac{dA}{dx} = 4x - 48x^{-2} = 0$ $\quad 4x = \frac{48}{x^2}$

$4x^3 = 48$ $\quad x^3 = 12$ $\quad x = \sqrt[3]{12}$

$V = \left(\sqrt[3]{12}\right)^2 y = 12$ $\quad y = \sqrt[3]{12}$

b) $2x^2 + 4xy = 20$ $\quad V = x^2 y$

maximize volume

$4xy = 20 - 2x^2$ $\quad V = x^2\left(\frac{20 - 2x^2}{4x}\right)$

$y = \frac{20 - 2x^2}{4x}$ $\quad = 5x - \frac{x^3}{2}$

$\frac{dV}{dx} = 5 - \frac{3x^2}{2} = 0$ $\quad 10 = 3x^2$ $\quad \frac{10}{3} = x^2$

$x = \sqrt{\frac{10}{3}} = \frac{\sqrt{30}}{3}$

$2\left(\frac{\sqrt{30}}{3}\right)^2 + 4\left(\frac{\sqrt{30}}{3}\right) y = 20$

$$y = \frac{\sqrt{30}}{3}$$