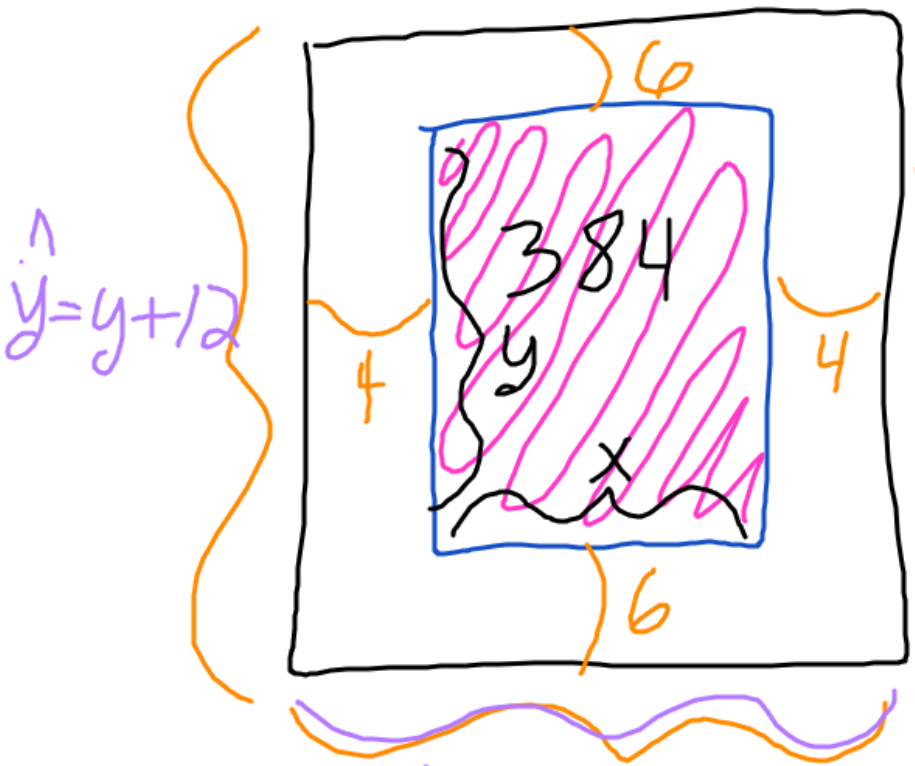
HW 21 #7



$xy = 384$

minimize $\hat{x}\hat{y} = A$

$A = (x+8)(y+12)$

$y = \frac{384}{x}$

minimize

$A = (x+8)\left(\frac{384}{x} + 12\right)$

$x = 16$ $\quad \hat{x} = 16 + 8 = \boxed{24}$

$y = 24$ $\quad \hat{y} = 24 + 12 = \boxed{36}$

$$A = \left(\frac{384}{x} + 12\right)(x+8)$$

$$A' = \frac{-384}{x^2}(x+8) + \frac{384}{x} + 12$$

$$= \frac{-384(x+8) + 384x + 12x^2}{x^2}$$

$$0 = \frac{12x^2 - 3072}{x^2} = \frac{12(x^2-256)}{x^2}$$

$$0 = 12x^2 - 3072$$

$$\rightarrow x^2 = 256 \rightarrow x = 16$$

f.d.t.

A′: [0 — (−) — 16 — (+)

$x=16$ is a min, by the first dev. test

$$\lim_{x \to 0} \left[\frac{1}{x} - \csc(x) \right] = 0$$

$$\lim_{x \to 0} \frac{1}{x} - \frac{1}{\sin x}$$

$$\lim_{x \to 0} \frac{\sin x - x}{x \sin x}$$

$$\xrightarrow{L'H} \lim_{x \to 0} \frac{\cos x - 1}{\sin x + x \cos x}$$

$$\xrightarrow{L'H} \lim_{x \to 0} \frac{-\sin x}{\cos(x) + \cos(x) - x \sin x} \rightarrow \frac{0}{2 - 0} = \frac{0}{2} = 0$$

HW 21 #4

$xy = 100 \rightarrow y = \frac{100}{x}$

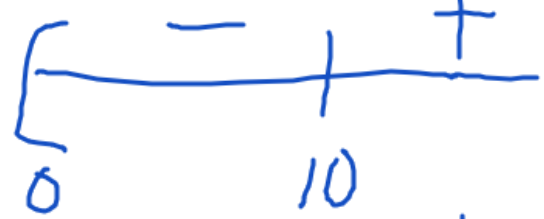
minimize $S = x + y$

$\min \quad S = x + \frac{100}{x}$

$S' = 1 - \frac{100}{x^2}$

$0 = 1 - \frac{100}{x^2}$

$\frac{100}{x^2} = 1 \rightarrow 100 = x^2 \rightarrow$ $y = 10$, $x = 10$

S': 

$x = 10$ is a min by f.d.t.