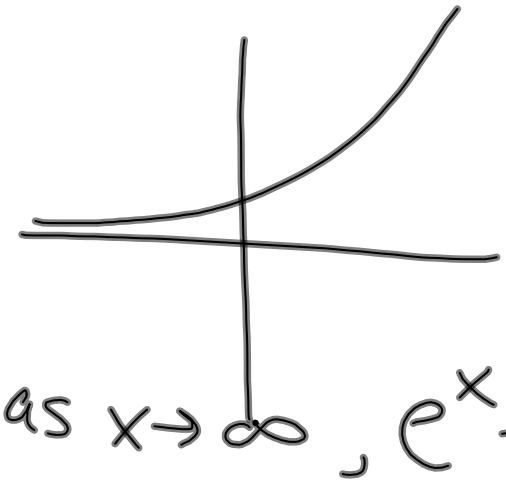
Review: Find the derivative.

$f(x) = 5^{\csc x}\sqrt{x^3 - 7x}$ $= (5^{\csc x})(x^3-7x)^{1/2}$

$f'(x) = 5^{\csc x} \cdot \frac{1}{2}(x^3-7x)^{-1/2} \cdot (3x^2-7) +$

$(x^3-7x)^{1/2}\left(5^{\csc x} \cdot \ln 5 \cdot (-\csc x \cot x)\right)$

$e^{\infty} = \infty$



$e^{-\infty} = \frac{1}{e^{\infty}}$

$\frac{1}{\infty} = 0$

$\frac{c}{\pm\infty} = 0$

as $x \to \infty$, $e^x \to \infty$

as $x \to -\infty$, $e^x \to 0$

3.7 Optimization Problems

4. find 2 positive #s whose product is 192 & the sum of the first plus 3 times the second is a minimum.

$xy = 192$ $\quad S(y) = \frac{192}{y} + 3y$

$S = x + 3y$ $\quad S'(y) = -\frac{192}{y^2} + 3$

$\frac{1}{x} = x^{-1}$

$(x^{-1})' = -x^{-2} = -\frac{1}{x^2}$

$-\frac{192}{y^2} + 3 = 0$

$-\frac{192}{y^2} = -3$

$192 = 3y^2$

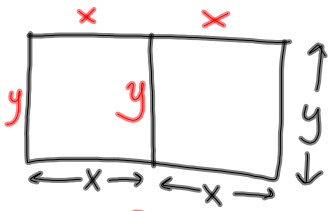
$\frac{192}{3} = y^2$

$64 = y^2$

$8 = y$

2 #'s: 8 & 24

18. rancher has 200 ft of fence what dimensions maximize area?



$A = 2xy$

$A(y) = 2(50 - \frac{3}{4}y)y$

$4x + 3y = 200$

$x = \frac{200 - 3y}{4} = 50 - \frac{3}{4}y$

$A(y) = 100y - \frac{3}{2}y^2$

$A'(y) = 100 - 3y$

$100 - 3y = 0$

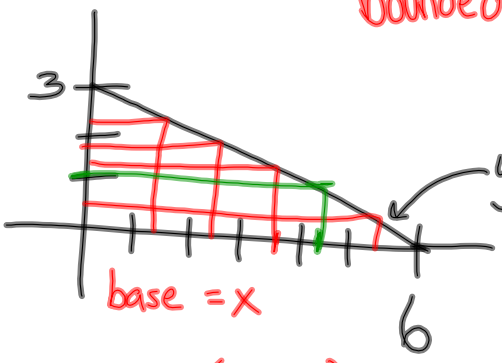
$\frac{100}{3} = \frac{3y}{3}$

$y = \frac{100}{3}$

$x = \frac{200 - 3(\frac{100}{3})}{4} = 25$

$y = \frac{100}{3}$ ft; $x = 25$ ft

24. maximize area of bounded rectangle



$y = \frac{6-x}{2}$ = height

$A = x\left(\frac{6-x}{2}\right) = 3x - \frac{x^2}{2}$

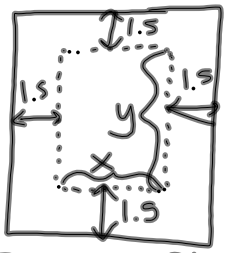
$A' = 3 - x$

$3 - x = 0$

$x = 3$

$\frac{6-3}{2} = \boxed{\frac{3}{2}}$

30.



36 in² of print

margins are 1½ in

find page dimensions that use least amt. of paper

$xy = 36 \quad y = \frac{36}{x}$

$A = (x+3)(y+3)$

$= (x+3)\left(\frac{36}{x}+3\right)$

$A(x) = 36 + 3x + 3\left(\frac{36}{x}\right) + 9$

$A'(x) = 3 + 3(36)\cdot\frac{-1}{x^2} = 0$

$3 = 3(36)\cdot\frac{1}{x^2}$

$x^2 = 36$

$x = 6$ in

$y = \frac{36}{6} = \boxed{6 \text{ in}}$

3.7

3, 5, 17, 23, 29