Group Quiz 4
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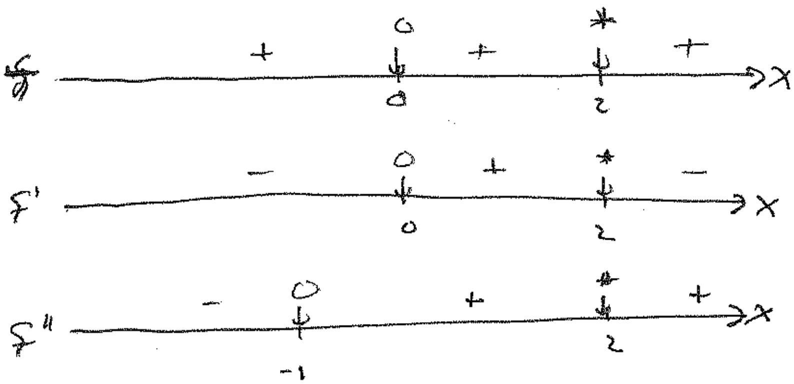
Math 148 – Fall 2011

Name: KEY

No work = no credit

No calculators (or at least not too much)

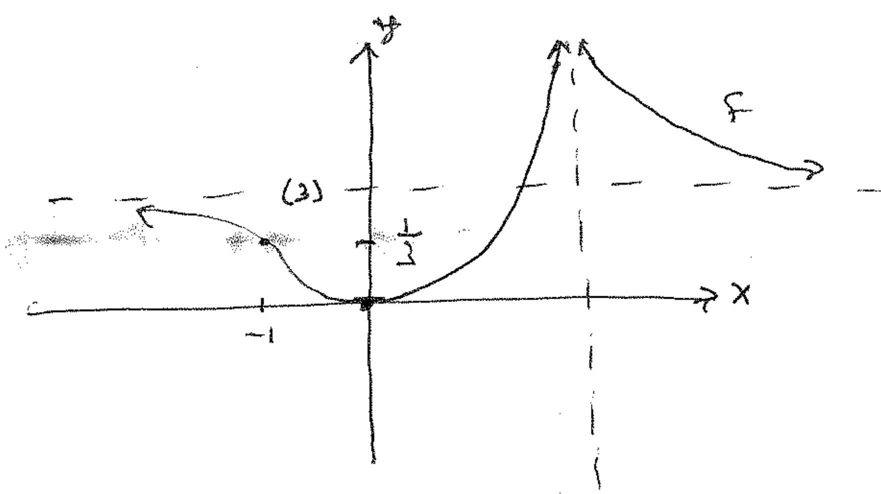
1.) Consider the $f(x)=\dfrac{3x^2}{(x-2)^2}$ with derivatives $f'(x)=\dfrac{-12x}{(x-2)^3}$ and $f''(x)=\dfrac{24(x+1)}{(x-2)^4}$. Use these to find any horizontal and vertical asymptotes, critical points, relative maximum, relative minima, and points of inflection. Then sketch the graph of the function.



H.A. @ $y=3$

$$\lim_{x\to\infty} \frac{3x^2}{x^2-4x+4} = \lim_{x\to\infty} \frac{3}{1-\frac{4}{x}+\frac{4}{x^2}} = 3$$

V.A. @ $x=2$



2.) A firm can produce only 48 ~~144~~ units per week. If its total cost function is $C(x) = 500 + 1500x$ and is total revenue function is $R(x) = 1600x - x^2$ dollars, how many units x should it produce to maximize its profit? Find the maximum profit.

$P(x) = R(x) - C(x)$

$= 1600x - x^2 - (500 + 1500x)$

$= 100x - x^2 - 500$

$\Rightarrow P' = 100 - 2x$

and solve $0 = 100 - 2x$

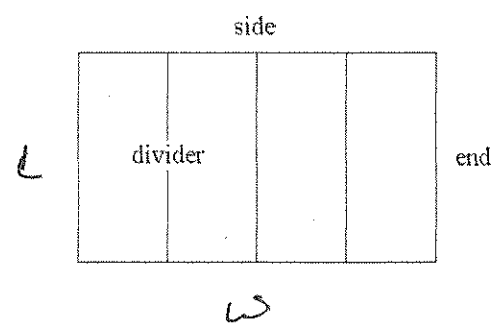
$\Rightarrow x = 50$

max

P': $+$ | 0 at $x = 50$ | $-$

max when 48 units are produced of \$1996 profit each week.

3.) A kennel of 640 square feet is to be constructed as shown. The cost is \$4 per running foot for the sides and \$1 per running foot for the ends and dividers. What are the dimensions of the kennel that will minimize the cost?



$L \cdot w = 640$

$C = 4 \cdot 2 \cdot w + 5 \cdot 1 \cdot L$

$= 8w + 5L$

$\Rightarrow C(w) = 8w + 5 \cdot \frac{640}{w}$

$\Rightarrow C'(w) = 8 - \frac{3200}{w^2}$

and solve $0 = 8 - \frac{3200}{w^2}$

$\Rightarrow 3200 = 8w^2$

$\Rightarrow w^2 = 400$

$\Rightarrow w = \pm 20$

min

C': $+$ | 0 at $w = -20$ | $-$ | 0 at $w = 20$ | $+$

The cost is minimized when the pen is $20' \times 32'$.