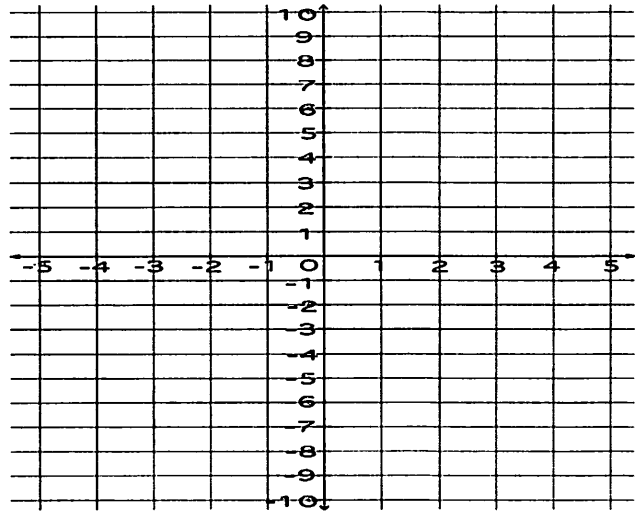
Calculus CH.3 Review #2 Name: ______________________________ Per: _____

Note all relevant properties of f and sketch the graph (Label the maximum, minimum and inflection points)

$f(x)=6x^2-x^4$

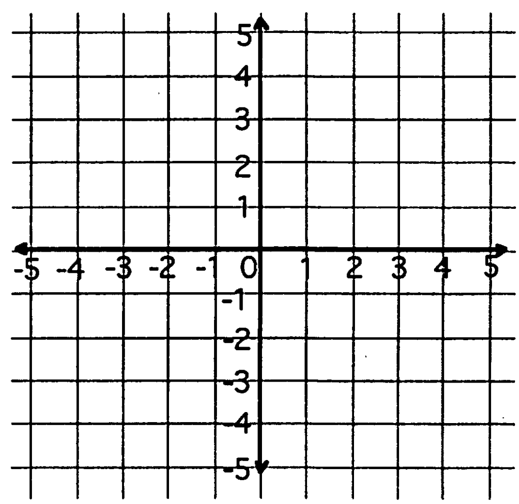
<u>x – int</u> <u>y – int</u> <u>v.asym.</u> <u>h.asym.</u> <u>rel.max.</u> <u>rel.min.</u> <u>inc.</u> <u>dec.</u> <u>inf.pts.</u> <u>conc.up</u> <u>conc.down</u>



Note all relevant properties of f and sketch the graph (Label the maximum, minimum and inflection points)

2) $f(x)=\dfrac{-2}{x^2-1}$ $\qquad f'(x)=\dfrac{4x}{\left(x^2-1\right)^2}$ $\qquad f''(x)=\dfrac{-4-12x^2}{\left(x^2-1\right)^3}$

<u>x – int</u> <u>y – int</u> <u>v.asym.</u> <u>h.asym.</u> <u>rel.max.</u> <u>rel.min.</u> <u>inc.</u> <u>dec.</u> <u>inf.pts.</u> <u>conc.up</u> <u>conc.down</u>



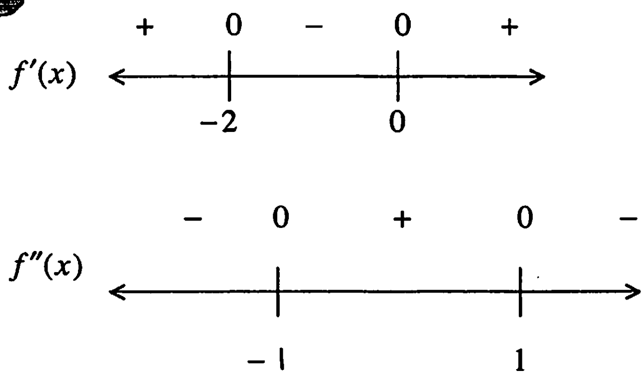
3) **<u>Find each indicated asymptote</u>**

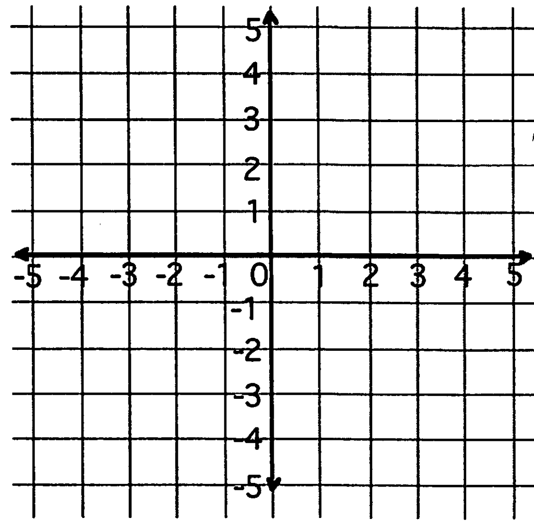
a) $f(x)=\dfrac{8x^3-2x-5}{7x-3}$ $\qquad$ b) $f(x)=\dfrac{5x-7}{\sqrt{9x^2+8x-2}}$ $\qquad$ c) $f(x)=\dfrac{5x^2-7x+1}{x-3}$

vert. asym. __________ **horiz. asym.** __________ **oblique asym.** __________

4) Graph from $[-3,4]$

$f(-3)=1$ $\quad f(-2)=3$ $\quad f(0)=0$ $\quad f(1)=2$ $\quad f(4)=3$





5) A rectangle is bounded by the x-axis and the equation $y=\sqrt{200-x^2}$.

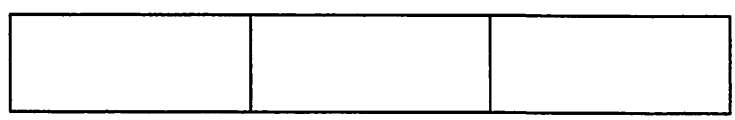
a) What length and width should the region be so that its area is a maximum? ____________________

b) What is the area? ________________

6) You have 1200 ft. of fencing and wish to fence off three adjacent rectangular fields as shown below.

a) What length and width should the region be so that its area is a maximum? ____________________

b) What is the area? ________________



7) I need to fence off one field along a straight river. I need the area to be 1352 ft^2.

What length and width should the region be so that its perimeter is a minimum? ____________________

What is the perimeter? ________________

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Note all relevant properties of f and sketch the graph (Label the maximum, minimum and inflection points)

1) $f(x)=6x^2-x^4$ $f'(x)=12x-4x^3=-4x(x^2-3)$ $f''(x)=12-12x^2=-12(x^2-1)$

x – int	y – int	v.asym.	h.asym.	rel.max.	rel.min.	inc.	dec.	inf.pts.	conc.up	conc.down
$0, \pm\sqrt{6}$	0	$\emptyset$	$\emptyset$	$(\pm\sqrt{3}, 9)$	$(0,0)$			$(-1,5)$ $(1,5)$		

• $f(x)=0 \Leftrightarrow x^2(6-x^2)=0$

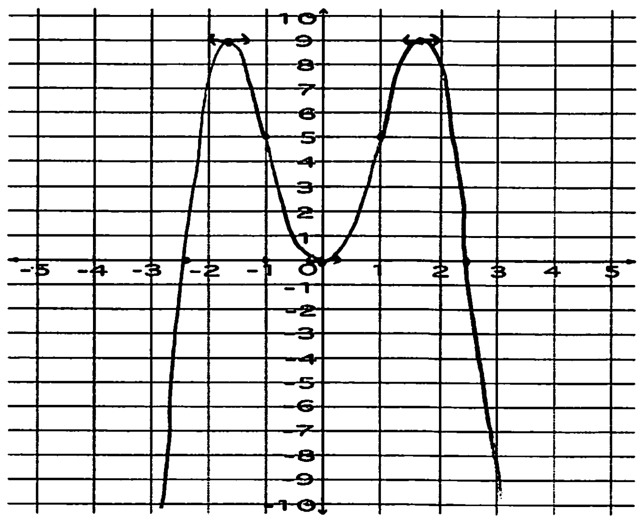
$\Leftrightarrow x=0$ or $x^2=6$

$\Leftrightarrow x=0$ or $x=\pm\sqrt{6}$

We could notice that f is even ($f(-x)=f(x)$) which means that the graph is symetrical about the y-axis...

x	$-\infty$	$-\sqrt{3}$	0	$\sqrt{3}$	$+\infty$
$f'(x)$	$+$	0 $-$	0 $+$	0 $-$	
$f(x)$	$-\infty \nearrow$	9 $\searrow$	0 $\nearrow$	9 $\searrow$	$-\infty$

x	$-\infty$	-1	1	$+\infty$
$f''(x)$	$-$	0 $+$	0 $-$	
$f(x)$	concave down	up	down	



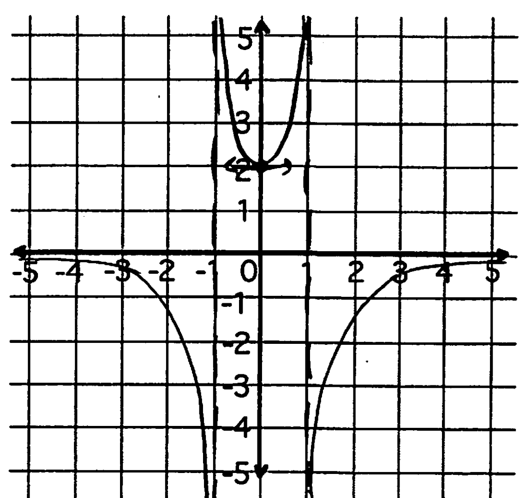
Note all relevant properties of f and sketch the graph (Label the maximum, minimum and inflection points)

2) $f(x)=\dfrac{-2}{x^2-1}$ f is even again $f'(x)=\dfrac{4x}{(x^2-1)^2}$ $f''(x)=\dfrac{-4-12x^2}{(x^2-1)^3}=\dfrac{-4(3x^2+1)}{(x^2-1)^3}$

x – int	y – int	v.asym.	h.asym.	rel.max.	rel.min.	inc.	dec.	inf.pts.	conc.up	conc.down
$\emptyset$	2	$x=\pm1$	$y=0$	$\emptyset$	$(0,2)$					

x	$-\infty$	-1	0	1	$+\infty$
$f'(x)$	$-$	‖ $-$	0 $+$	‖ $+$	
$f(x)$	$0 \searrow -\infty$	‖ $+\infty \searrow$	2 $\nearrow +\infty$	‖ $-\infty \nearrow$	0

x	$-\infty$	-1	1	$+\infty$
$f''(x)$	$-$	‖ $+$	‖ $-$	
$f(x)$	concave down	‖ up	‖ down	



3) **Find each indicated asymptote**

can't be factored

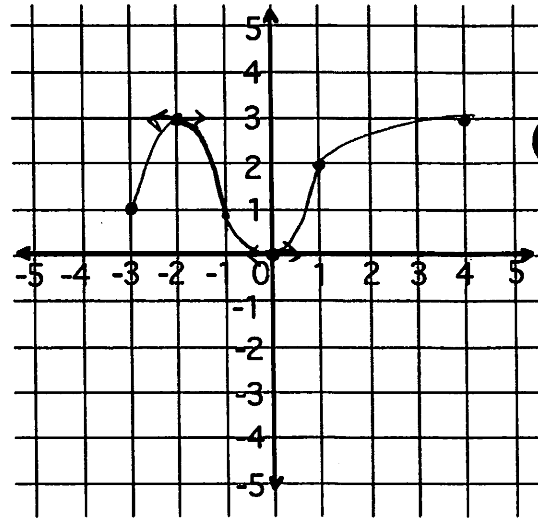
a) $f(x)=\dfrac{8x^3-2x-5}{7x-3}$ b) $f(x)=\dfrac{5x-7}{\sqrt{9x^2+8x-2}}$ c) $f(x)=\dfrac{5x^2-7x+1}{x-3}=5x+8+\dfrac{25}{x-3}$

vert. asym. $x=3/7$ **horiz. asym.** $y=\pm\frac{5}{3}$ **oblique asym.** $y=5x+8$

$\lim_{x\to\pm\infty} f(x)=\lim_{x\to\pm\infty}\dfrac{5x}{|3x|}$

4) Graph from $[-3,4]$

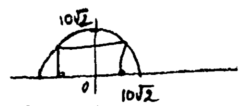
$f(-3)=1$ $\quad f(-2)=3$ $\quad f(0)=0$ $\quad f(1)=2$ $\quad f(4)=3$



$f'(x)$	$+$	0	$-$	0	$+$
		-2		0	

$f''(x)$	$-$	0	$+$	0	$-$
		-1		1	

5) A rectangle is bounded by the x-axis and the equation $y=\sqrt{200-x^2}$.



a) What length and width should the region be so that its area is a maximum? length: 20 , width 10

b) What is the area? 200

$A = 2x\sqrt{200-x^2}$ $\quad D=[0, 10\sqrt{2}]$

$A'(x) = 2\sqrt{200-x^2} - \dfrac{4x^2}{2\sqrt{200-x^2}}$

$= \dfrac{2(200-x^2) - 2x^2}{\sqrt{200-x^2}} = \dfrac{-4(x^2-100)}{\sqrt{200-x^2}}$

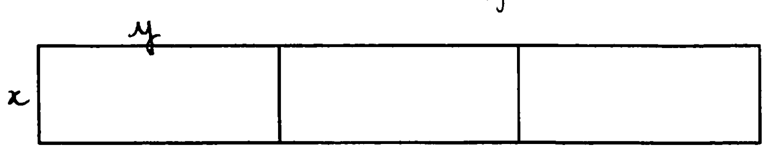
x	0	10	$10\sqrt{2}$
A'	$+$	0	$-$ ‖
A	↗		↘

$A(10) = 200$

6) You have 1200 ft. of fencing and wish to fence off three adjacent rectangular fields as shown below.

a) What length and width should the region be so that its area is a maximum? length: 300ft width = 150ft $(y=100)$

b) What is the area? 45000 ft^2



$4x + 6y = 1200$ $\quad y = -\frac{2}{3}x + 200$

$A = 3xy$

$= -2x^2 + 600x$ $\quad D=[0,300]$

$A' = -4x + 600$

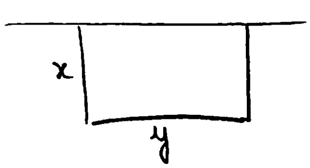
$= -4(x-150)$

x	0	150	300
A'	$+$	0	$-$
A	↗		↘

if $x=150$, $3y = 300$

$A(150) = 45000$

7) I need to fence off one field along a straight river. I need the area to be 1352 ft^2.
What length and width should the region be so that its perimeter is a minimum? length: 52ft, width: 26ft
What is the perimeter? 104 ft



- $xy = 1352$
  $y = \dfrac{1352}{x}$

- $P = 2x + y$
  $= 2x + \dfrac{1352}{x}$ $\quad D=(0,\infty)$

$P'(x) = 2 - \dfrac{1352}{x^2}$

$= \dfrac{2(x^2-676)}{x^2}$

x	0	26	$+\infty$
P'	‖ $-$	0	$+$
P	‖ ↘		↗

$P(26) = 104$

if $x=26$, $y=52$