Practice, Practice, Practice.

1. (§4.5#11) Use the analysis presented in class (with parts A-G) to sketch the curves

$$\text{(a)}\ f(x) = \frac{1}{x^2-9}$$

A| Domain: $x^2-9\neq 0$

$x \neq \pm 3.$

Domain: $\mathbb{R}\setminus\{\pm 3\}$

B| x-int: $y=0$

$\frac{1}{x^2-9}=0$ can't happen

$\boxed{\text{No x-int}}$

y-int: $x=0$

$\boxed{\frac{1}{-9}=y}$

C| $f(x)=\frac{1}{x^2-9}$

$f(-x)=\frac{1}{(-x)^2-9}$]=

$\boxed{\text{even}}$

D| HA: $\lim_{x\to\infty}\frac{\frac{1}{x^2}}{1-\frac{9}{x^2}}=0$

$\lim_{x\to-\infty}\frac{1}{x^2-9}=0$

$\boxed{y=0:\text{HA}}$

VA: $\lim_{x\to3^+}\frac{1}{x^2-9}=+\infty$

$\lim_{x\to3^-}\frac{1}{x^2-9}=-\infty$

$\lim_{x\to-3^+}\frac{1}{x^2-9}=-\infty$

$\lim_{x\to-3^-}\frac{1}{x^2-9}=-\infty$

$\boxed{\text{VA: } x=\pm3}$

E| crit #'s

$f(x)=(x^2-9)^{-1}$

$f'(x)=-(x^2-9)^{-2}(2x)$

$=\frac{-2x}{(x^2-9)^2}$

$f'=0$| $-2x=0 \Rightarrow x=0$

f' DNE| $(x^2-9)^2=0 \Rightarrow x=\pm3$

E.5|

	-3		0		3	
f'	$+$	|	$+$	|	$-$	|	$-$
f	↗	|	↗	|	↘	|	↘

$f(-3)$ DNE $\quad f(0)=\frac{-1}{9} \quad f(3)$ DNE

F| Local Max: @ $(0,-\frac{1}{9})$

Local Min: none

G| $f''(x)=\frac{-2(x^2-9)^{\cancel{2}}+2x\cdot2\cancel{(x^2-9)}2x}{(x^2-9)^{\cancel{4}3}}$

$=\frac{-2x^2+18+8x^2}{(x^2-9)^3}=\frac{6x^2+18}{(x^2-9)^3}=f''(x)$

$f''=0$| $6x^2+18=0 \rightarrow 6x^2=-18$ can't happen

f'' DNE $\quad x^2-9=0 \Rightarrow x=\pm3.$

		-3		3	
f''	$+$	|	$-$	|	$+$
f	∪	|	∩	|	∪

P of I: None $x=\pm3 \notin$ Domain.