Math 119 HW #9

Section 5.4 # 4, 12, 13, 35, 36

#4 $f(x) = x^3 - \frac{15}{2}x^2 - 18x - 1$

$f'(x) = 3x^2 - 15x - 18$

$= 3(x^2 - 5x - 6)$

$= 3(x-6)(x+1)$

$f'=0$: $x=6$, $x=-1$

$f''(x) = 6x - 15$

$f''=0$: $6x - 15 = 0$

$6x = 15$

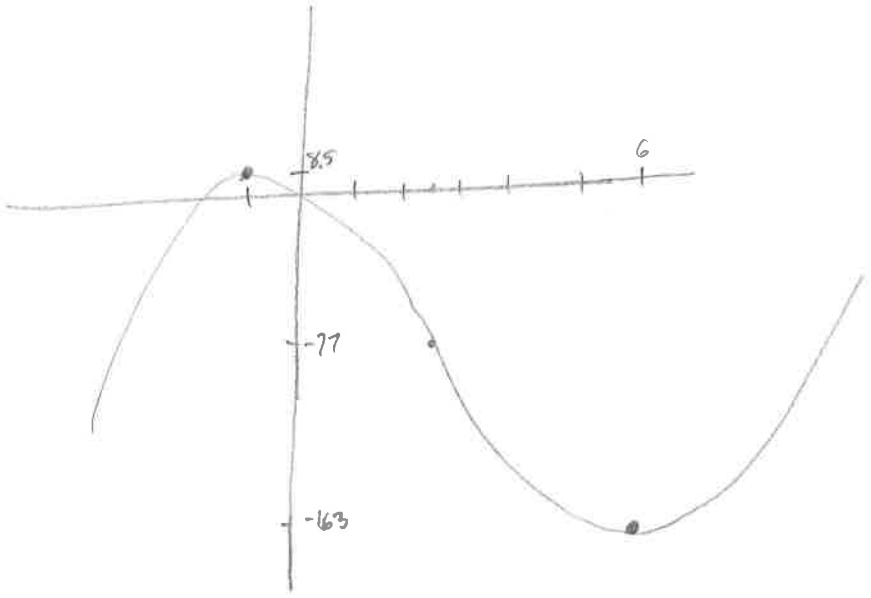
$x = \frac{15}{6} = \frac{5}{2} = 2.5$

$f(-1) = 8.5$

$f(2.5) = -77.25$

$f(6) = -163$

x		-1		2.5		6	
f		8.5		-77.25		-163	
f'	$+++0$		$---$		$---0+++$		
f''	$---$		$---0+++$				



#12 $f(x) = 16x + \frac{1}{x^2} = 16x + x^{-2}$

$f'(x) = 16 + -2x^{-3} = 16 - 2\frac{1}{x^3}$

f' DNE: $x = 0$

$f' = 0$: $16 - 2 \cdot \frac{1}{x^3} = 0$

$16 = 2 \cdot \frac{1}{x^3}$

$16x^3 = 2$

$x^3 = \frac{1}{8}$

$x = \sqrt[3]{\frac{1}{8}} = \frac{1}{2}$

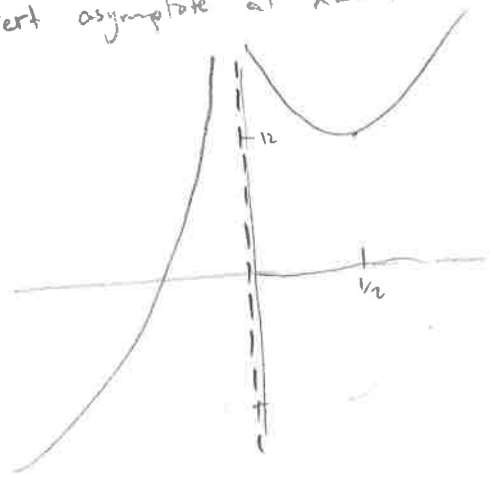
$f''(x) = 6x^{-4} = \frac{6}{x^4}$

f'' DNE: $x = 0$

$f'' = 0$: $\frac{6}{x^4} = 0$ $\quad 6 = 0$ $\quad f'' = 0$ never.

no horz. asymptotes,

vert asymptote at $x = 0$.



$f'(-1) = 16 - 2\frac{1}{(-1)^3}$

$= 16 + 2$ pos

$f'(.01) = 16 - 2 \cdot \frac{1}{.01}$

$= 16 - 2 \cdot 100$ neg

$f'(1) = 16 - 2$ pos

f'' is always pos

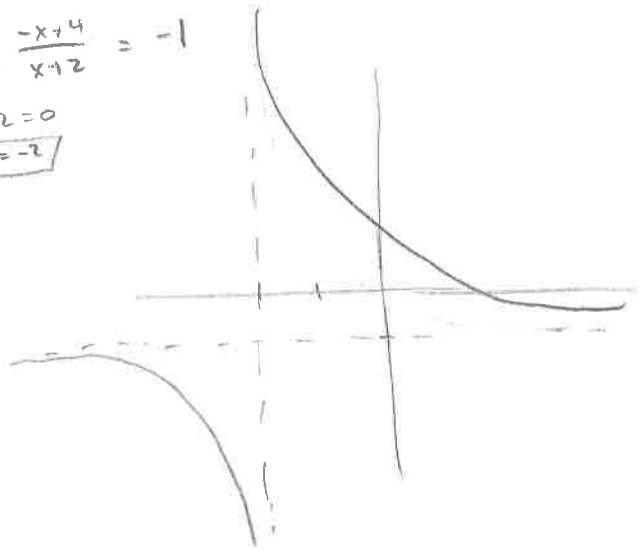
x		0		.5
f		DNE		12
f'	+ + +	DNE	− −	0 + + + +
f''	+ + +	DNE	+ +	− − − + +

#13 $f(x) = \frac{-x+4}{x+2}$

horz. tote: $\lim_{x \to \infty} \frac{-x+4}{x+2} = -1$

vert tote: $x + 2 = 0$

$x = -2$



$f'(x) = \frac{(x+2) \cdot -1 - (-x+4) \cdot 1}{(x+2)^2}$

$= \frac{-x-2+x-4}{} = \frac{-6}{(x+2)^2} = -6(x+2)^{-2}$

$f''(x) = 12(x+2)^{-3} = \frac{12}{(x+2)^3}$

$f'(x) = 0$ never

$f'(x)$ DNE $x = -2$

$f'' = 0$ never

f'' DNE $x = -2$

x		−2	
f		DNE	
f'	+ − −	DNE	− − −
f''	− − −	DNE	+ + +

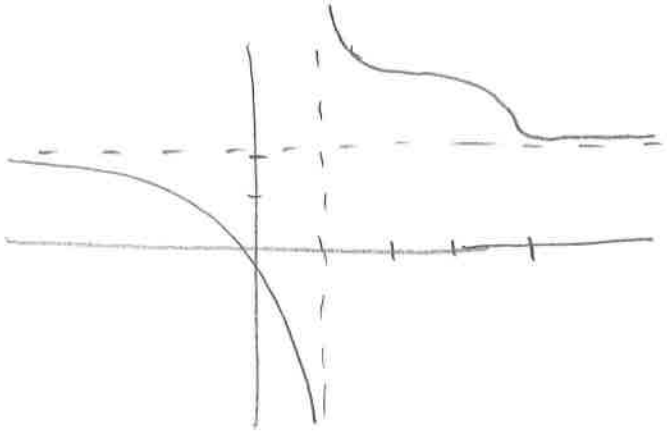
f' always neg.

$f''(-3) = \frac{12}{(-1)^3}$ neg

$f''(0) = \frac{12}{2^3}$ pos

#35 Make a chart:

x		1		2		4	
f'	−	−	DNE	−	−	−	−
f''	−	−	DNE	+	−	+	+



#36

x		-6		1		3	
f'	−	−	+	+	−	−	+	+
f''	+	+	−	−	−	−	+	+