Mr. Konichek
Notes 4.3

4.22
Notes 4.3 pg 8 Sketch graphs

#5 $f(x) = x^2 - 2x + 3$ polynomial so no asymptotes

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

$2(x-1) = 0$

$x = 1$

(0) (2)
(Test pts) in $f'(x)$
− +

$f(1) = 1^2 - 2(1) + 3 = 1 - 2 + 3 = 2$

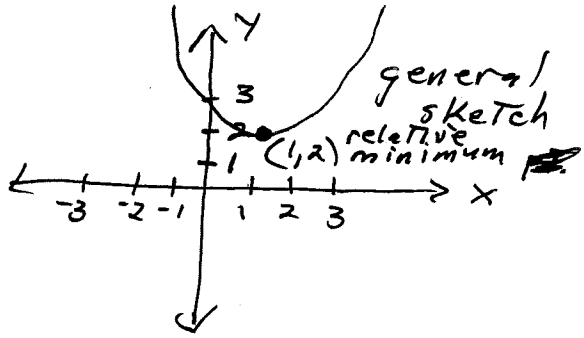
so critical pt. at $(1, 2)$

$f''(x) = 2$

$2 \neq 0$

so no inflection pt.

(0) 2 (3)
in $f''(x)$ + +



#6 $f(x) = 2x^3 - 15x^2 + 36x - 20$ polynomial so no asymptotes

$f'(x) = 6x^2 - 30x + 36$

$6(x^2 - 5x + 6) = 0$

$(x-6)(x+1) = 0$

$x = 6$ and $x = -1$

(-2) -1 (0) 6 (7)
(Test pts) in $f'(x)$

$f(6) = 2(6)^3 - 15(6)^2 + 36(6) - 20 = 2(216) - 540 + 216 - 20$ (432)

$f(6) = 88$

$f(-1) = 2(-1)^3 - 15(-1)^2 + 36(-1) - 20$

$f(-1) = -2 - 15 - 36 - 20 = -73$

so critical pts. at $(6, 88)$ and $(-1, -73)$ were actually not critical pts.

$f''(x) = 12x - 30$

$6(x - 5) = 0$

$x = 5$

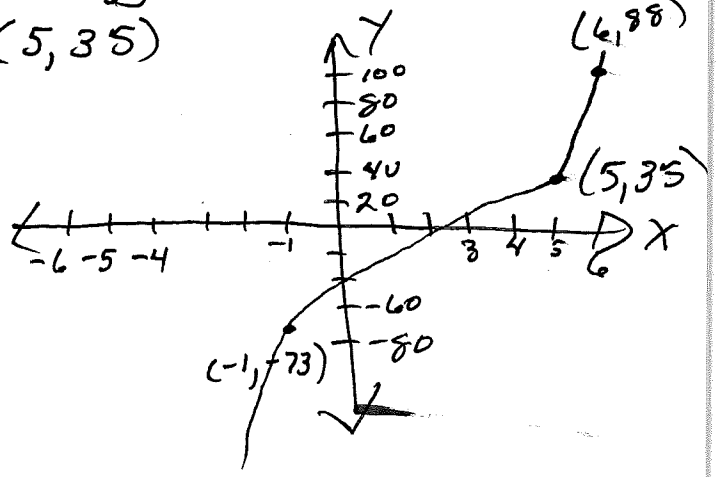
(0) 5 (6)
(Test pts) in $f''(x)$

$f(5) = 2(5)^3 - 15(5)^2 + 36(5) - 20$ (225)

$f(5) = 250 - 375 + 180 - 20 = 35$

so an inflection pt. at $(5, 35)$

(so no extrema)



Notes 4.2 & 4.3 Page 8 sketch graphs 7, 8

7. $f(x) = \dfrac{(x-2)}{(x+2)}$

vertical asymptote V.A. $\Rightarrow$ $x = -2$ as $x \neq -2$

H.A. $y = 1$ as $\lim_{x \to \pm\infty} 1 = 1$ (note: x coef.'s)

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

$f'(x) \neq 0$ so no extrema

$\dfrac{4}{(x+2)^2} \cdot \dfrac{(x-2)^2}{(x-2)^2} = \dfrac{4(x-2)^2}{(x^2-4)^2}$ did not help

$$f''(x) = \frac{(x+2)^2(0) - 4(2)(x+2)(1)}{(x+2)^4} = \frac{x^2+4x+4 - 8x - 16}{(x+2)^4} = \frac{(x-6)(x+2)}{(x+2)^4} = \frac{x^2-4x-12}{(x+2)^4}$$

$\cap$ | $\cup$ (0) 6 (7)

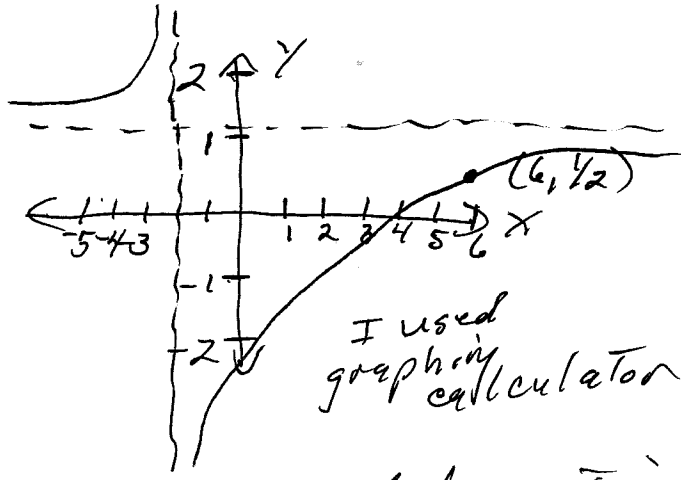
$f''(x) = \dfrac{(x-6)}{(x+2)^3}$

$f(6) = \dfrac{6-2}{6+2} = \dfrac{4}{8} = \dfrac{1}{2}$

$\dfrac{(x-6)}{(x+2)^3} = 0$

$x = 6$

so inflection pt. at $(6, \frac{1}{2})$



I used graphing calculator

Note: IT appears with asymptotes the 1st & 2nd derivative Test are not helpful. Just obtain asymptotes and try Test points.

Next example

8. $g(x) = \dfrac{6x+1}{3x-9}$

V.A. $x = 3$ (as $x \neq 3$)

H.A. $y = 2$ (as $\lim_{x \to \pm\infty} \frac{6}{3} = \frac{6}{3} = 2$)

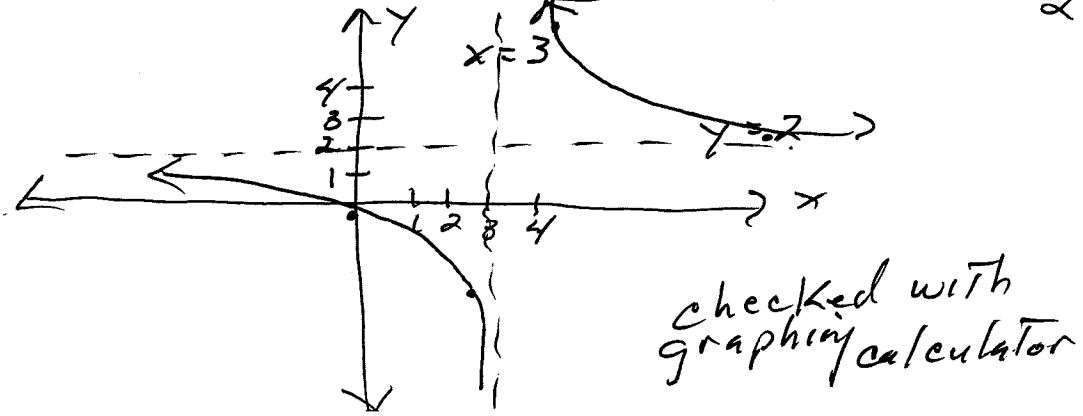
Test pts. $(0, -\frac{1}{9})$

$(10, \frac{61}{21})$

$(2, \frac{13}{-3})$

$(-10, \frac{-59}{-39})$

$(4, \frac{25}{3})$



checked with graphing calculator