

HW #12

Section 5.3 28, 34, 60

Section 5.4 4, 13

5.3 #28

conc. up on $(-\infty, 3)$
 conc. down on $(3, \infty)$
 inflection pt at $x=3$

5.3 #34

$$f(x) = 8 - 6x - x^2$$

$$f'(x) = -6 - 2x$$

$$f''(x) = -2 \quad \text{always negative,}$$

so f is always conc. down, no inf. pts.

5.3 #60

$$f(x) = 2x^3 - 4x^2 + 2$$

$$f'(x) = 6x^2 - 8x$$

$$f''(x) = 12x - 8$$

crit pts:

$$f' = 0: 6x^2 - 8x = 0$$

$$2x(3x - 4) = 0$$

$$x=0 \quad x=4/3$$

$$x=0: f''(0) = 12 \cdot 0 - 8 \text{ neg}$$

so $f(0)$ is a ~~local~~ relative maximum

$$x=4/3: 12 \cdot 4/3 - 8 = 4 \cdot 4 - 8 \text{ pos}$$

so $f(4/3)$ is a relative minimum

5.4 #4 sketch $f(x) = x^3 - \frac{15}{2}x^2 - 18x - 1$

$$f'(x) = 3x^2 - 15x - 18 = 3(x^2 - 5x - 6) = \boxed{3(x-6)(x+1)}$$

crit. pts: ~~3~~

$$f' = 0 \quad 3(x-6)(x+1) = 0$$

$$x=6, x=-1.$$

f' DNE never.

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

possible inf pt:

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

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

f'' DNE never

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

$$= -1 - \frac{15}{2} + 18 - 1 = 8.5$$

$$f(2.5) = (2.5)^3 - \frac{15}{2}(2.5)^2 - 18(2.5) - 1$$

$$= -77.25$$

$$f(6) = 6^3 - \frac{15}{2} \cdot 6^2 - 18 \cdot 6 - 1$$

$$= -163$$

$$f'(-2) = 3(-2-6)(-2+1) = \text{pos}$$

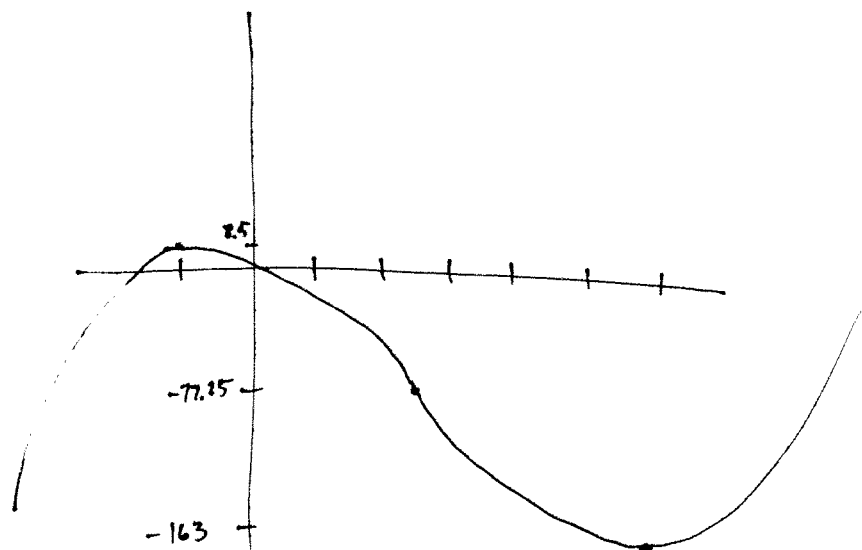
$$f'(0) = 3(0-6)(0+1) = \text{neg}$$

$$f'(7) = 3(7-6)(7+1) = \text{pos}$$

$$f''(0) = 6 \cdot 0 - 15 = \text{neg}$$

$$f''(3) = 6 \cdot 3 - 15 = \text{pos}$$

	-1	2.5	6	
	----- ----- ----- -----			
f:	8.5	-77.25	-163	
f':	+	0	-	0
f'':	-	-	0	+



5.4 # 13 sketch $f(x) = \frac{-x+4}{x+2}$

$$f'(x) = \frac{(x+2) \cdot -1 - (-x+4) \cdot 1}{(x+2)^2} = \frac{-x-2+x-4}{(x+2)^2} = \frac{-6}{(x+2)^2} = -6(x+2)^{-2}$$

crit pts:

$$f' = 0 \quad \frac{-6}{(x+2)^2} = 0 \quad -6 = 0 \quad \text{never}$$

$$f' \text{ DNE} \quad (x+2)^2 = 0 \quad x+2 = 0 \quad \underline{x = -2}$$

$$f''(x) = 12(x+2)^{-3} \cdot 1 = \frac{12}{(x+2)^3}$$

infl pts:

$$f''(x) = 0 \quad \frac{12}{(x+2)^3} = 0 \quad 12 = 0 \quad \text{never}$$

$$f'' \text{ DNE} \quad (x+2)^3 = 0 \quad x+2 = 0 \quad \underline{x = -2}$$

v. Asote $x+2=0$
 $\underline{x = -2}$

h. Asote

$$\lim_{x \rightarrow \infty} \frac{-x+4}{x+2} = \frac{-1}{1} = \underline{-1}$$

	-2	
f	DNE	
f'	-	-
f''	-	+

$$f'(-3) = \frac{-6}{(-3+2)^2} = \text{neg}$$

$$f'(0) = \frac{-6}{2^2} = \text{neg}$$

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

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

