§ 4.3 #s 1, 4, 7, 10, 13, 19, 22, 25, 28, 33,

Fri.   38, 41, 46, 50 , 53, 56
$$\underbrace{}_{ab} \quad \underbrace{}_{a}$$

Mon. § 4.4 #s 15, 20, 23, 25, 26, 29, 30, 34, 37, 44, 45

Plus as many as you have time for.
This is just the stuff I'm collecting.
Teacher tendency: Grade evens.

Questions?

28   §4.1   Abs max/min

$-3(x^{2/3})$ $-1 \le x \le 1$

$f'(x) = -2x^{-\frac{1}{3}} = \dfrac{-2}{x^{1/3}}$ $f(0) = 0$

cp: $x = 0$ $f(-1) = -3$

$f(1) = -3$

$(0, 0)$ Max

$(-1, -3)$ $(1, -3)$ MIN

Min.
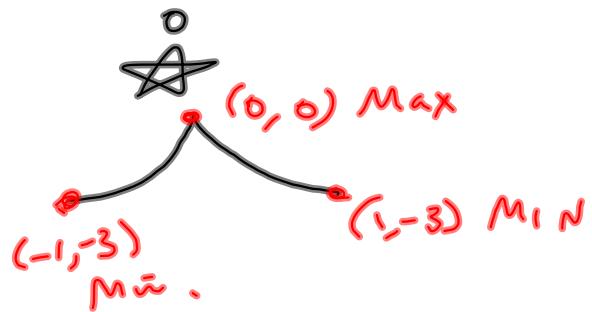
Abs. max of $y = 0$ @ $x = 0$

.. min .. $y = -3$ @ $x = -1$ & $x = 1$

\# 43   cp's

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

$$f'(x) = (4-x)^3 + x\left(3(4-x)^2\right)(-1)$$

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

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

$$= (4-x)^2(4-4x) = (4-x)^2(4)(1-x)$$

$$\boxed{x=4, \; x=1}$$

↳ I usually want to see
$(x, f(x))$ for each of these

$f'(x)$ tells us what it's doing
$f(x)$ ‥   ‥   where it is.

4.3

1$\underline{st}$ Derivative Test   c is c.p.

$-(x-c)^2$ $-(x-c)^{2/3}$

f' $\xleftarrow{\hspace{2cm}+\hspace{1.5cm}-\hspace{2cm}}$ LOCAL
                                                                    f(c) is max
              c

f' $\xleftarrow{\hspace{2cm}-\hspace{1.5cm}+\hspace{2cm}}$ f(c) is $\overset{LOCAL}{min}$.
              c

$(x-c)^2$ $(x-c)^{2/3}$

f' $\xleftarrow{\hspace{2cm}-\hspace{1.5cm}-\hspace{2cm}}$ Terrace
              c   pt. $-(x-c)^3$

                                                            $f'(c)=0$

                                                  $-(x-c)^{1/3}$

                                                  $f'(c) \neq$

f' $\xleftarrow{\hspace{2cm}+\hspace{1.5cm}+\hspace{2cm}}$ Same deal,
              c   but
                        $(x-c)^3$

              $(x-c)^{1/3}$

§ 4.4 concavity

f'' $\xleftarrow{\qquad - \qquad\qquad | \qquad + \qquad\qquad}\rightarrow$

c

$f' > 0$ ↗

$f' < 0$ ↘

$\left.\begin{array}{l} \\ \\ \end{array}\right\}$ Both cases, f' is decreasing

f'' $\xleftarrow{\qquad - \qquad\qquad | \qquad + \qquad\qquad}\rightarrow$

c

f' is increasing.

$\left\{\begin{array}{l} \\ \\ \end{array}\right.$

↗ $f' > 0$

↘ $f' < 0$
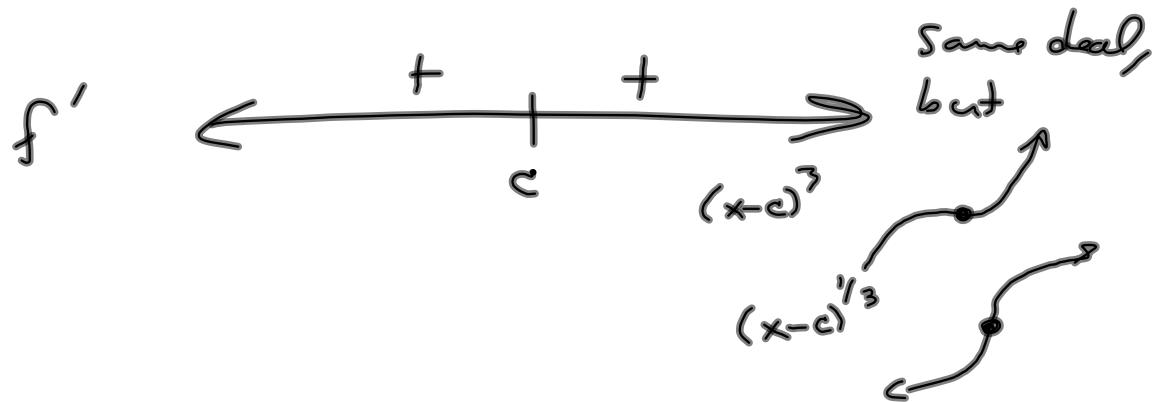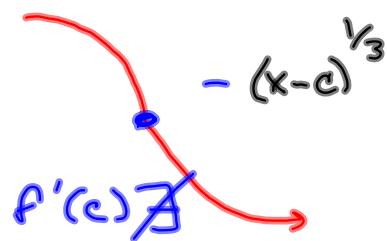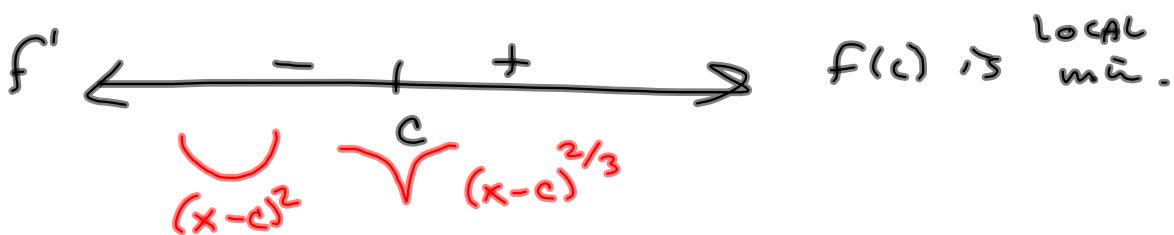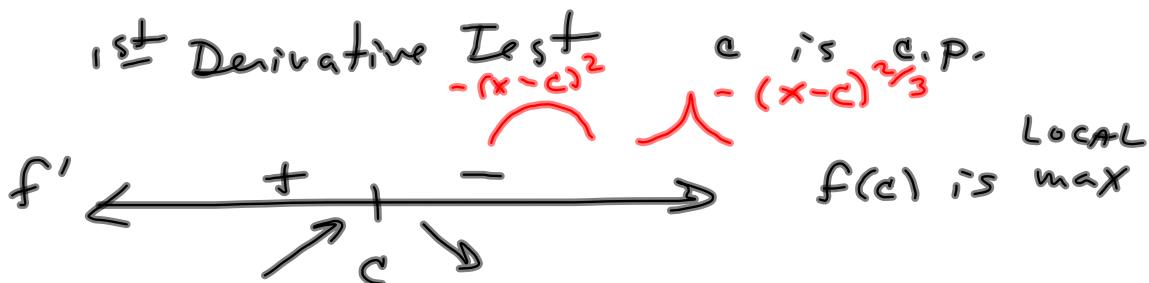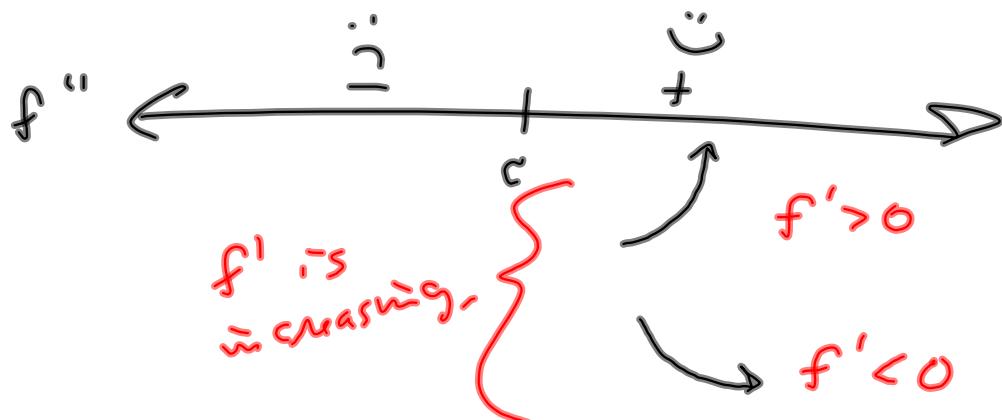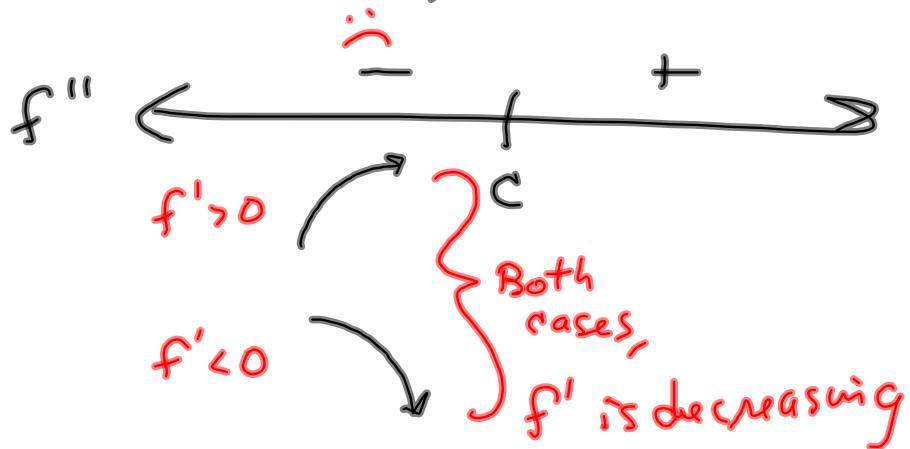
Inflection point @ c : $f''(c) = 0$ and f'' changes sign.

$f''(c) \not\exists$ & f'' changes sign

2nd Derivative Test

$f' = 0$ & $f'' > 0$ $\smile$

$\longrightarrow$ Min

$f' = 0$ & $f'' < 0$ $\frown$

Max

$\longleftrightarrow$ f'

$\longleftrightarrow$ f''

for graphing

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

$$f'(x) = 2x - 4 \overset{\text{SET}}{=\!=} 0 \implies x = 2 \rightsquigarrow (2, -1)$$

$$f''(x) = 2 > 0 \quad \text{always.} \qquad\qquad f(2)$$

combine

(2, -1)

f'

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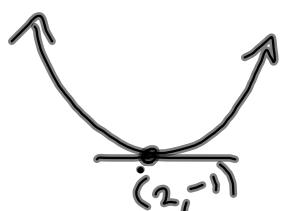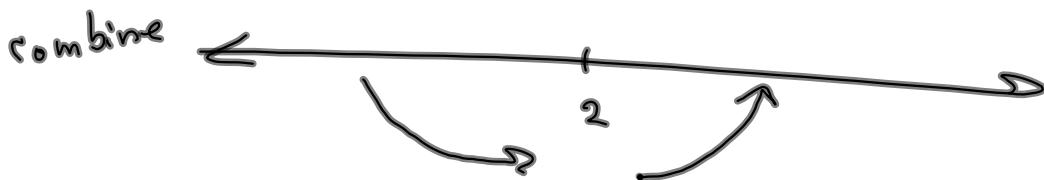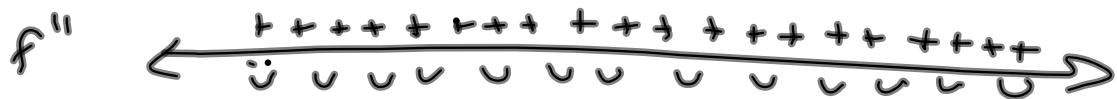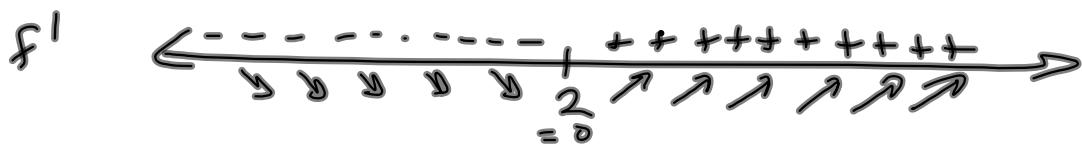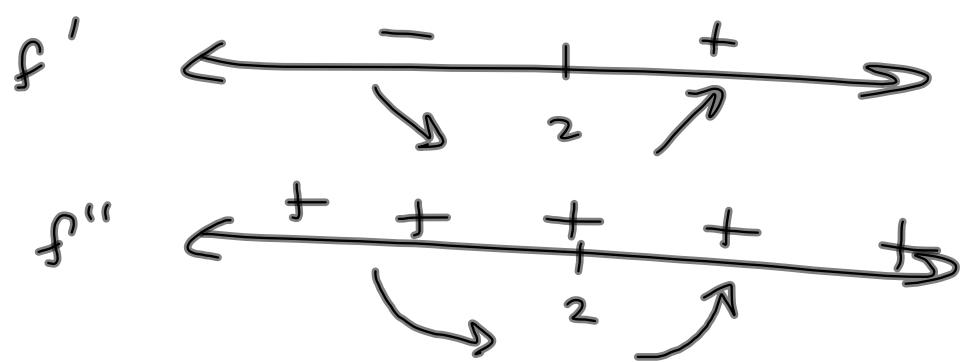
$$f(x) = -x^4 + 6x^2 - 4$$

$$f'(x) = -4x^3 + 12x \overset{SET}{=} 0$$

$$\Longrightarrow -4x(x^2 - 3) = -4x(x - \sqrt{3})(x + \sqrt{3})$$

cp's: $x = 0, \pm\sqrt{3}$

$f(0) = -4 \rightsquigarrow (0, -4)$
$f(\sqrt{3}) = 5 \rightsquigarrow (\sqrt{3}, 5)$ } Extrema
$f(-\sqrt{3}) = 5 \rightsquigarrow (-\sqrt{3}, 5)$

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

$\overset{SET}{=} 0 \Longrightarrow x = \pm 1, \quad f(1) = 1 \rightsquigarrow (1,1) \text{ I.P.?}$
$\qquad\qquad\qquad\qquad f(-1) = 1 \rightsquigarrow (-1, 1) \text{ I.P.?}$