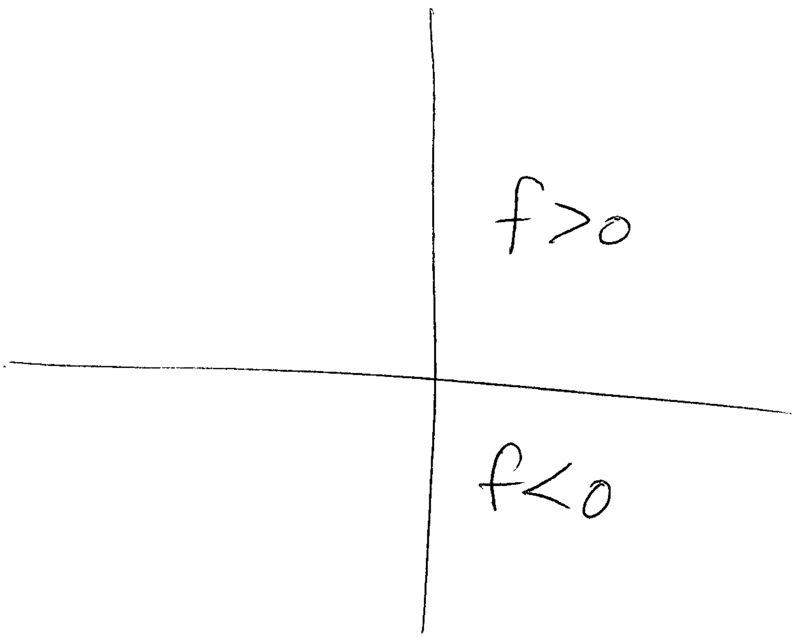
What does f tell you?

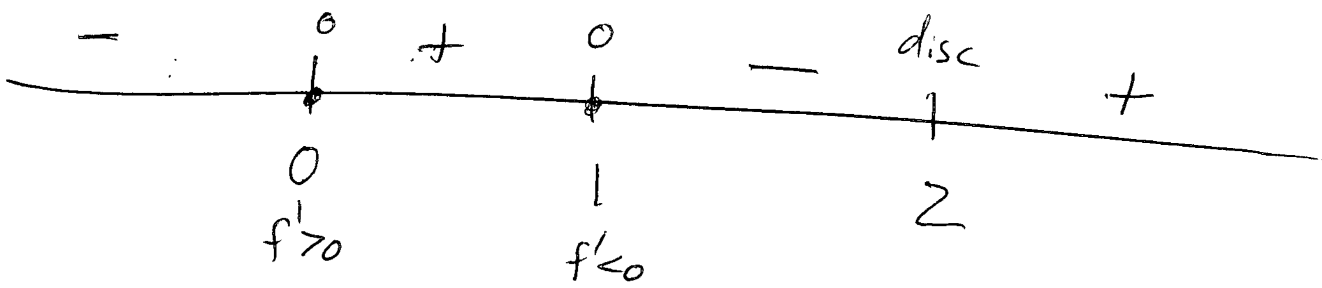
What does f' tell you?

What does f'' tell you?



Look ~~foe~~ for places where $f=0$ or f discontinuous.

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



3 ways to tell sign

1) Factor.
2) Derivatives.
3) Test points

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

$$= \frac{2x^2-5x+2-x^2+x}{(x-2)^2} = \frac{x^2-4x+2}{(x-2)^2}$$

$$f'(0) = \frac{2}{4} = \frac{1}{2} > 0$$

$$f'(1) = \frac{1-4+2}{(1-2)^2} = \frac{-1}{1} = -1 < 0$$

If $f(a)=0$ and $f'(a)>0$, then $f(x)>0$ to the right of a and $f(x)<0$ to the left.

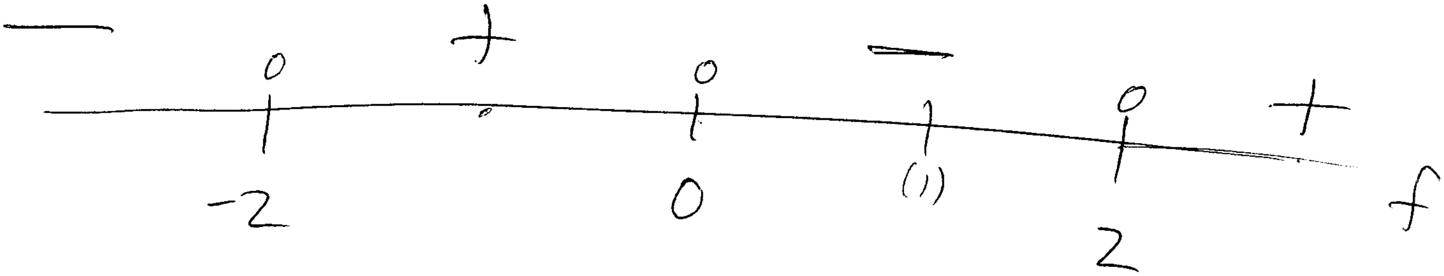
If $f(a)=0$ and $f'(a)<0$, then $f(x)>0$ to the left and $f(x)<0$ to the right.

If $f(a)=0$ and $f'(a)=0$, can't tell.

$f(x) = x^3 - \cancel{8}4x$

$f(1) = -3$ $\quad f(3) = 15$

$f(-1) = 3$ $\quad f(-3) = -15$



Look at sign of f'.

If $f' > 0$, increasing

If $f' < 0$, decreasing

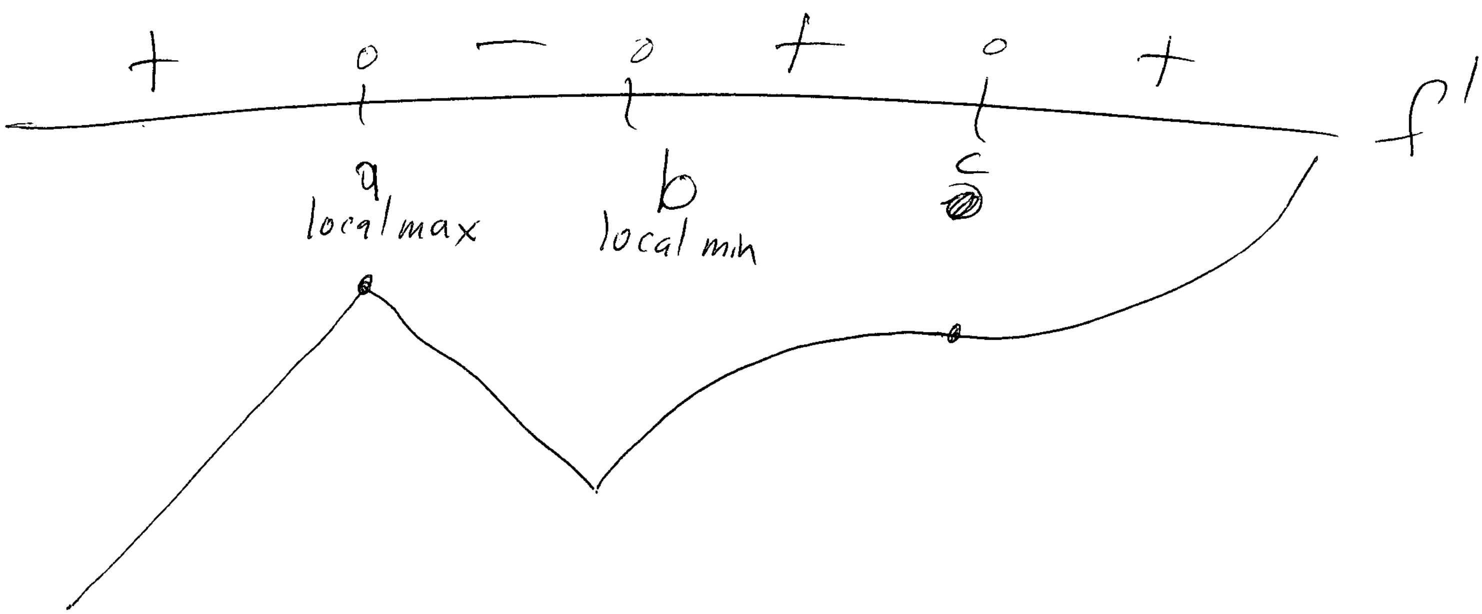
If $f' = 0$, momentarily flat

When f' goes from $-$ to $+$,

local ~~max~~ min

When f' goes from $+$ to $-$,

local ~~min~~ max



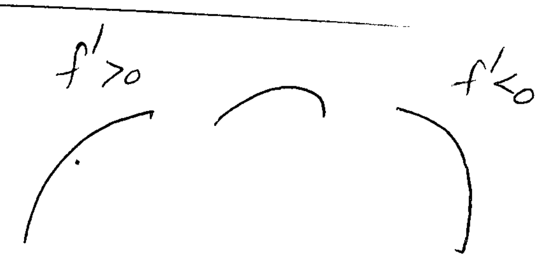
2nd derivative test

If $f'(a) = 0$ and $f''(a) > 0$,
(then $f'(x)$ must go from $-$ to $+$ at a,)
So a = local min

If $f'(a) = 0$ and $f''(a) < 0$,
local max

If $f'(a) = 0$ and $f''(a) = 0$, can't tell.

$f'' < 0$ curving down



$f'' > 0$ curving up