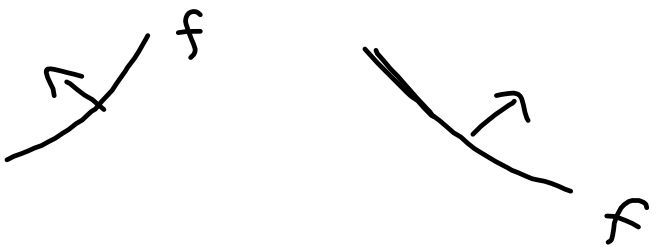
f concave up

f'' +

f' increasing

f' + and incr

f' − and incr



f concave down

f'' −

f' decreasing

f' + and decr.

f' − and decr.

#7: $y = 4x^3 + 21x^2 + 36x - 20$

concavity: want to know where concavity changes; where 2nd deriv. changes sign - can only happen where 2nd deriv. is 0 or undefined.

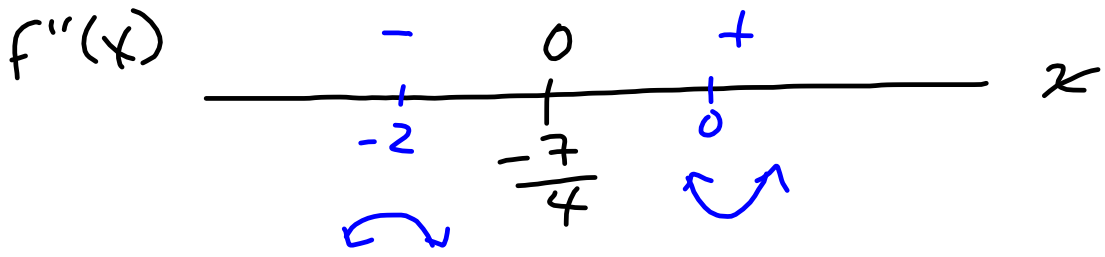
$y' = 12x^2 + 42x + 36$

$y'' = 24x + 42$

$24x + 42 = 0$

$6(4x + 7) = 0$

$4x + 7 = 0$



concave up: $\left(-\frac{7}{4}, \infty\right)$

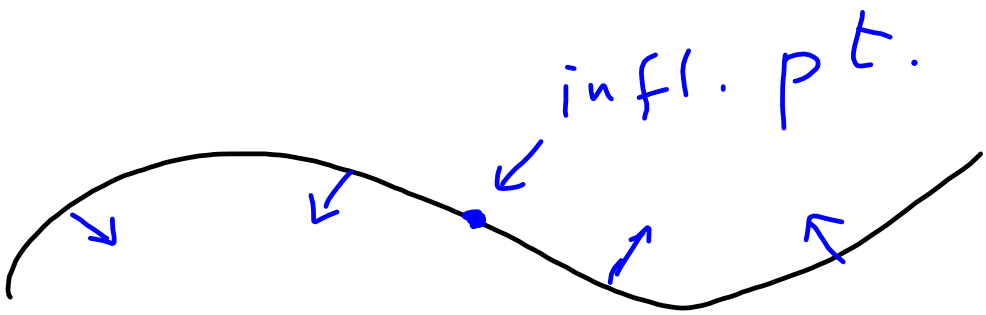
concave down: $\left(-\infty, -\frac{7}{4}\right)$

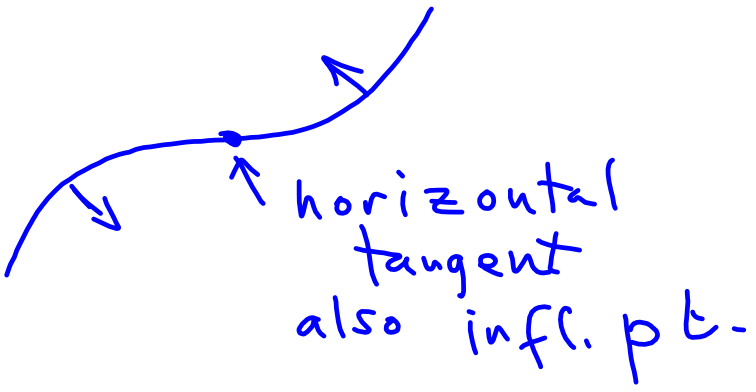
when concavity changes @ $x = c$, and there is a tangent line @ $x = c$, then

inflection point

(aka point of inflection)

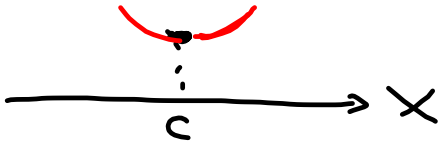
at $x = c$





Another test for local extremum: 2nd derivative test

Ex:



know: $f'(c) = 0$

$f''(c) > 0$

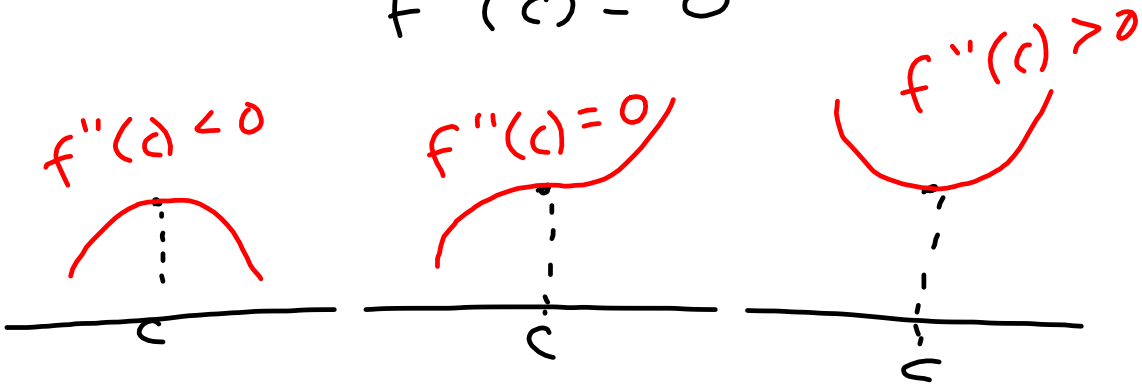
local min.

know: $f'(c) = 0$

$f''(c) < 0$

local max

$f'(c) = 0$



#23-24 looking at graph of f'.

#13 $y = x \cdot e^x$

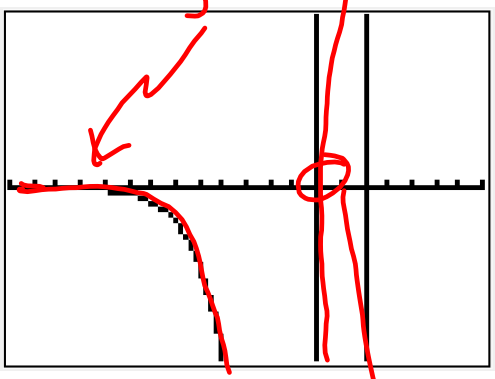
$y' = e^x + xe^x$

$y'' = e^x + e^x + xe^x$

$= 2e^x + xe^x$

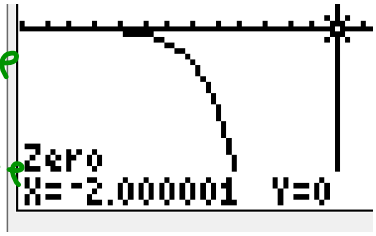
$= e^x(2 + x)$

$y'' = 0$ @ $x = -2$



$x < -2$ concave down

$x > -2$ concave up



$y'' = 0$ @ $x = -2$