Math 1A - What f' and f'' tell us about f

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1 What f' tells us about f

Increasing/Decreasing Test

(a) If $f'(x) > 0$ on an interval, then f is increasing on that interval

(b) If $f'(x) < 0$ on an interval, then f is decreasing on that interval

First Derivative Test

(a) If f changes from increasing to decreasing at c, then f has a local maximum at c

(b) If f' changes from decreasing to increasing at c, then f has a local min at c

2 What f'' tells us about f

Concavity Test

(a) If $f''(x) > 0$ on an interval, then f is concave up

(b) If $f''(x) < 0$ on an interval, then f is concave down

(c) If $f''(c) = 0$ and f'' **changes sign** at c, then $(c, f(c))$ is an inflection point of f

Second Derivative Test

(a) If $f'(c) = 0$ and $f''(c) > 0$, then f has a local minimum at c (think of $y = x^2$)

(b) If $f'(c) = 0$ and $f''(c) < 0$, then f has a local maximum at c (think of $y = -x^2$)

(c) If $f'(c) = 0$ and $f''(c) = 0$, then the second derivative test is inconclusive (**not** the same as saying that f has no local max/min at c)