Today

- Quiz 2
- Minima, maxima and inflection points
- Graphing

If you want to find a min/max of $f'(x)$, look for points at which. . .

(A) $f'(x) = 0$. --> potential extremum of $f(x)$

(B) $f'(x) = 0$ and $f''(x) \neq 0$. --> extremum of $f(x)$

(C) $f''(x) = 0$. --> potential extremum of $f'(x)$

(D) $f''(x) = 0$ and $f'''(x) \neq 0$. --> extremum of $f'(x)$

(E) Don't know.

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(D) $f''(x) = 0$ and $f'''(x) \neq 0$. --> extremum of $f'(x)$

(E) Don't know.

This is "SDT" where the function considered is f' instead of f! Would usually use "FDT".

Potential IPs

- A potential IP is a point **a** at which **$f''(a)=0$** because that MIGHT be a min/max of $f'(x)$.
- If $f''(x)$ changes sign at a potential IP of $f(x)$, then it is an IP of $f(x)$ because it's an extrema of $f'(x)$.
- If $f''(x)$ does not change sign at a potential IP of $f(x)$, then the potential IP is not an IP of $f(x)$!

Summary

- Use $f'(x)$ to determine intervals of increase/decrease of $f(x)$.
- Solve $f'(x)=0$ to find potential extrema $(x=a)$. Check that $f'(x)$ changes sign at a (FDT) or that $f''(a)$ <> 0 (SDT) to make sure.
- Use $f''(x)$ to determine intervals of concave up/down.
- Solve $f''(x)=0$ to find potential inflection points $(x=a)$. Check that $f''(x)$ changes sign at a ("FDT" or that $f'''(a)$ <> 0 ("SDT") to make sure.

Does $f(x) = x^4$ have an inflection point?

(A) $f'(0) = 0$ so yes.

(B) $f''(0) = 0$ so yes.

(C) $f'''(0) = 0$ so no.

(D) $f''(0) = 0$ and $f''(x) > 0$ for all $x \neq 0$ so no.

(E) Don't know.

Does $f(x) = x^4$ have an inflection point?

(A) $f'(0) = 0$ so yes.

(B) $f''(0) = 0$ so yes.

(C) $f'''(0) = 0$ so no.

"Second DT" applied to $f'(x)$ – fails so no conclusion.

(D) $f''(0) = 0$ and $f''(x) > 0$ for all $x \neq 0$ so no.

$f''(x) = 12x^2$

(E) Don't know.

Not sure about (C)? Try this for $f(x)=x^5$.