Today

- Reminders:
  - Assignment 4a on Tues 7am,
  - Assignment 4b on Fri 5pm,
  - Midterm 1 on Tues 6pm.
    - S.101 - HENN 200,
    - S.103 - Last name A-K: BUCH A203
    - S.103 - Last name L-Z: BUCH A103

Today

- Questions about previous material
- Concavity and inflection points

Concave up/down

- We say a function is **concave up** on some interval if $f'(x)$ is increasing on that interval.

When $f''(x)$ exists, same as $f''(x)>0$.

- We say a function is **concave down** on some interval if $f'(x)$ is decreasing on that interval.

When $f''(x)$ exists, same as $f''(x)<0$.

Inflection points

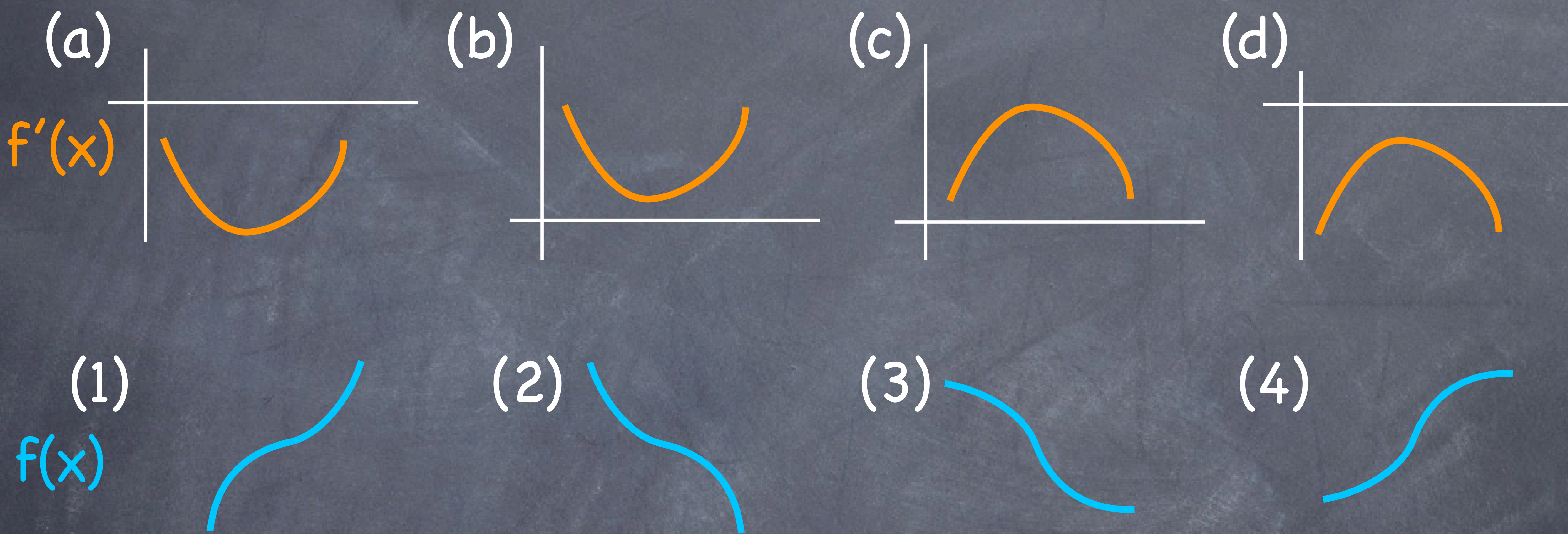
- An inflection point of f(x) is a point at which the concavity changes from up to down or down to up.

better!!

- A point **a** is an **inflection point** of a function f(x) provided that **a** is a **local minimum or a local maximum of f′(x).**

- Don't think about inflection points in terms of f″(x)!

Match f′(x) to f(x)



(A) 1d, 2b, 3a, 4c

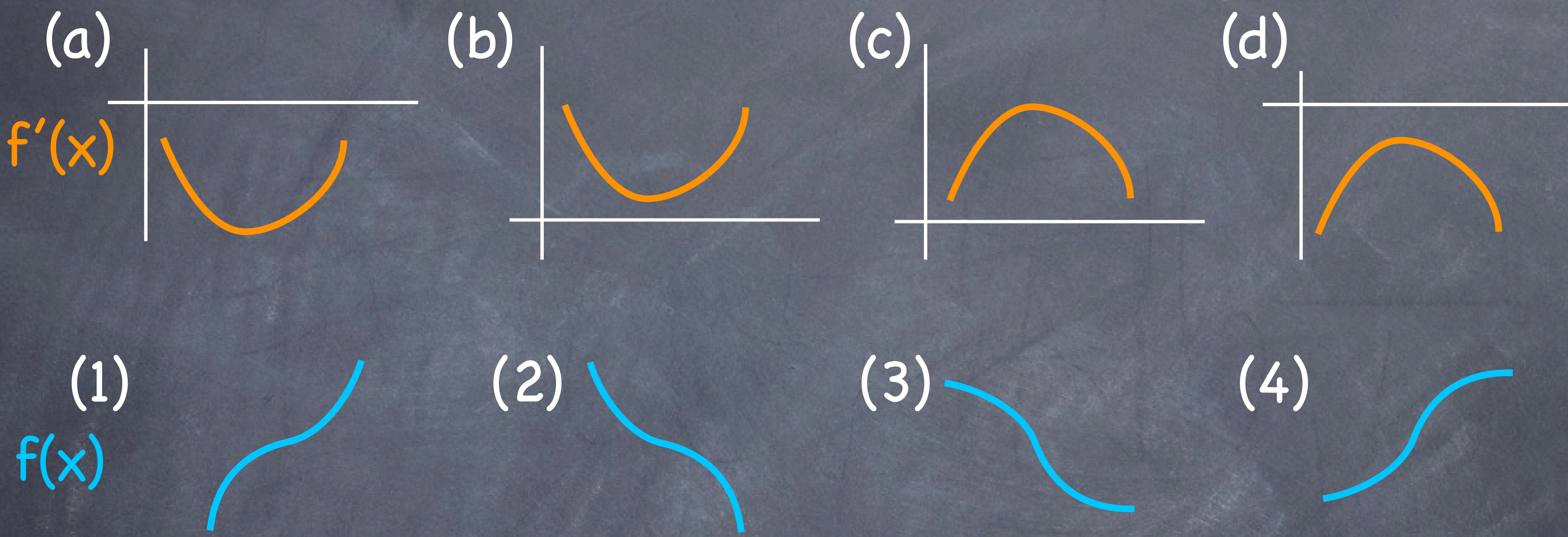
(B) 1b, 2d, 3a, 4c

(C) 1b, 2d, 3c, 4a

(D) 1c, 2a, 3d, 4b

(E) Don't know.

Match f′(x) to f(x)



(A) 1d, 2b, 3a, 4c

(B) 1b, 2d, 3a, 4c

(C) 1b, 2d, 3c, 4a

(D) 1c, 2a, 3d, 4b

(E) Don't know.

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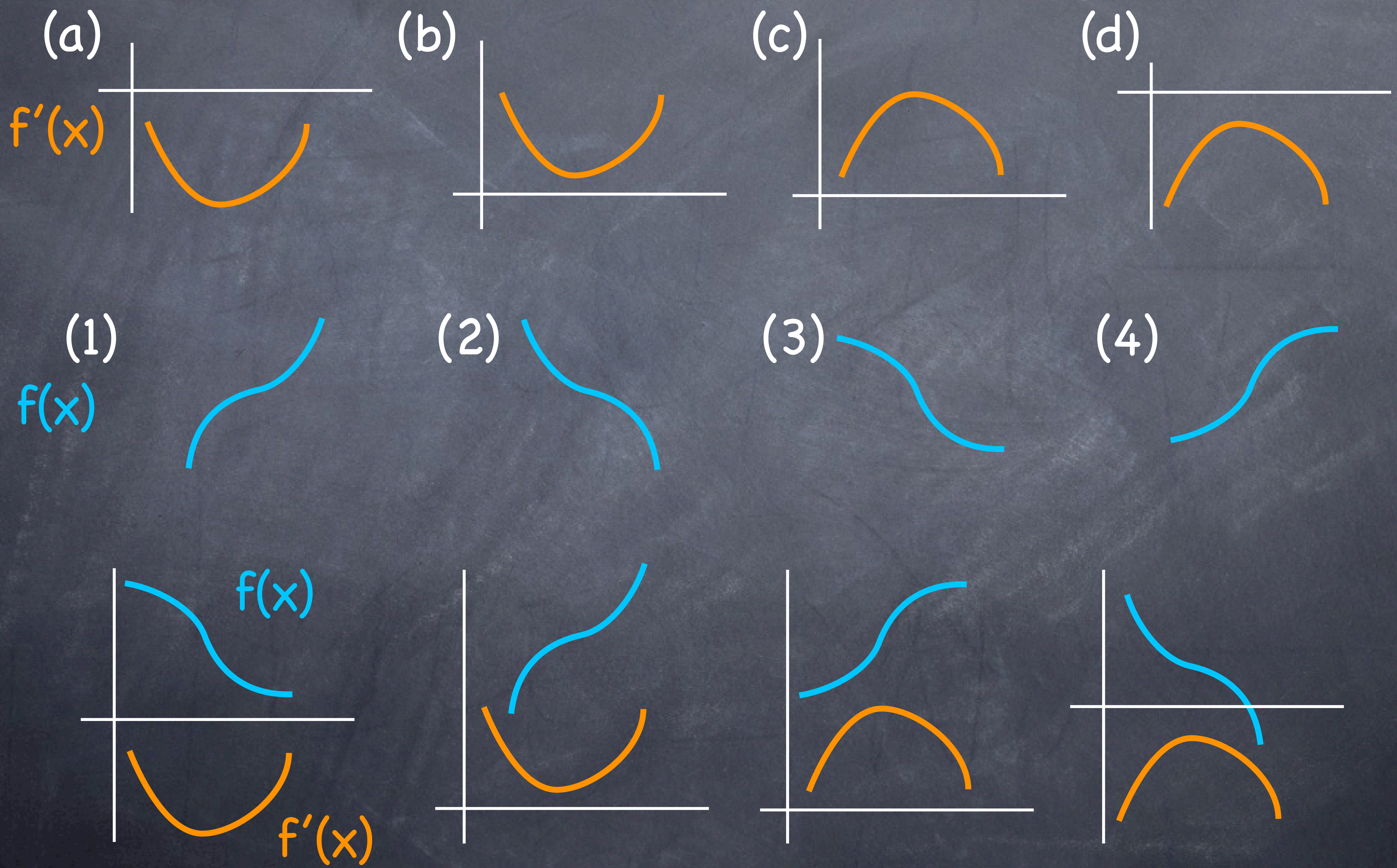

If you want to find a min/max of f′(x), look for points at which. . .

(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.