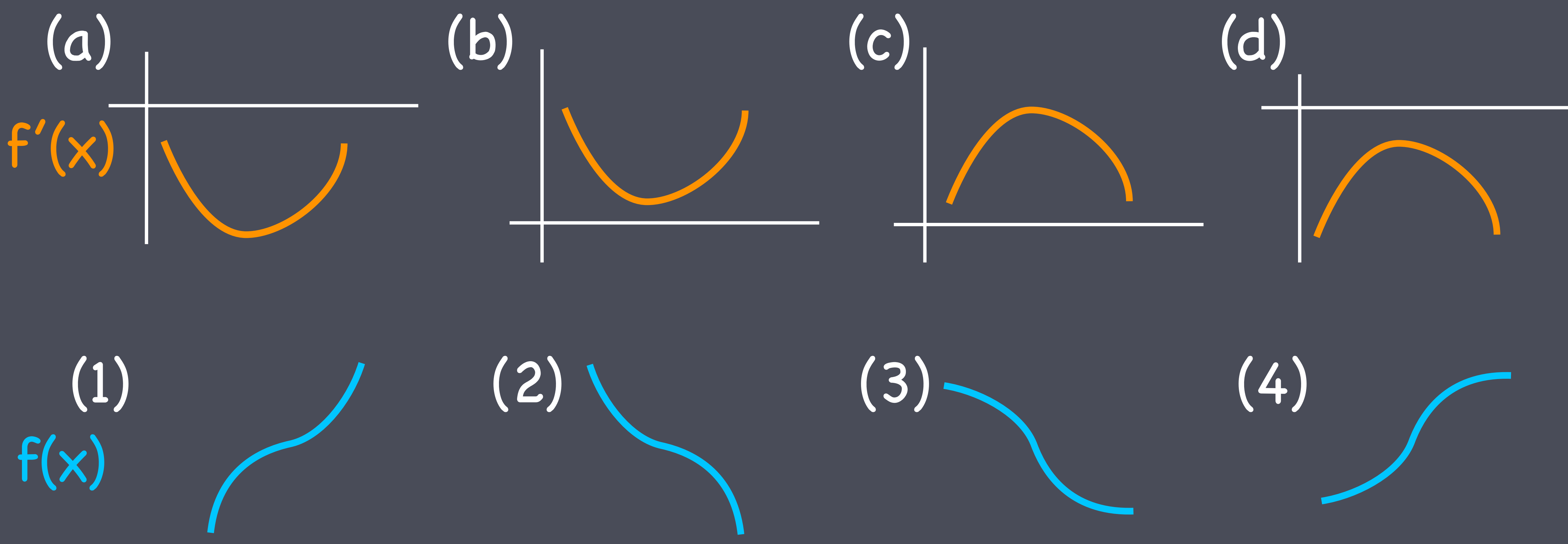
Today

- Note about Hill functions: $$\frac{x^n}{k^n + x^n} = 1 - \frac{k^n}{k^n + x^n}$$
- Shape of graphs using calculus

Match f′(x) to f(x)



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

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

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

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

(E) Don't know.

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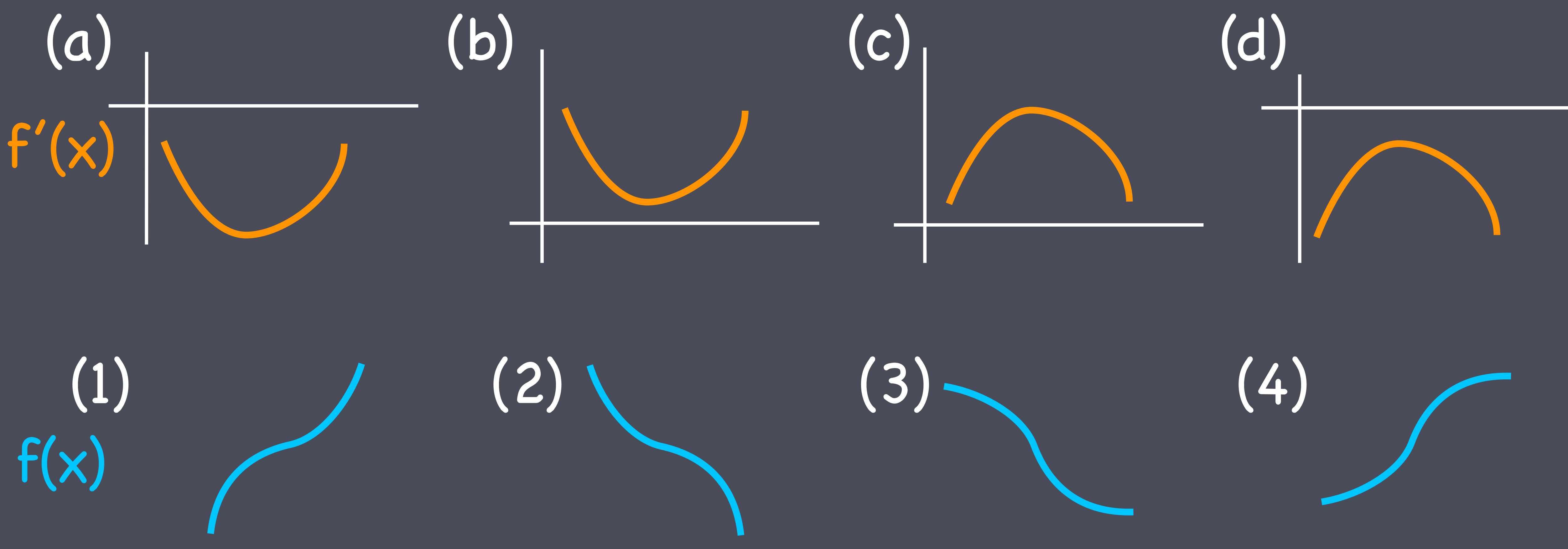

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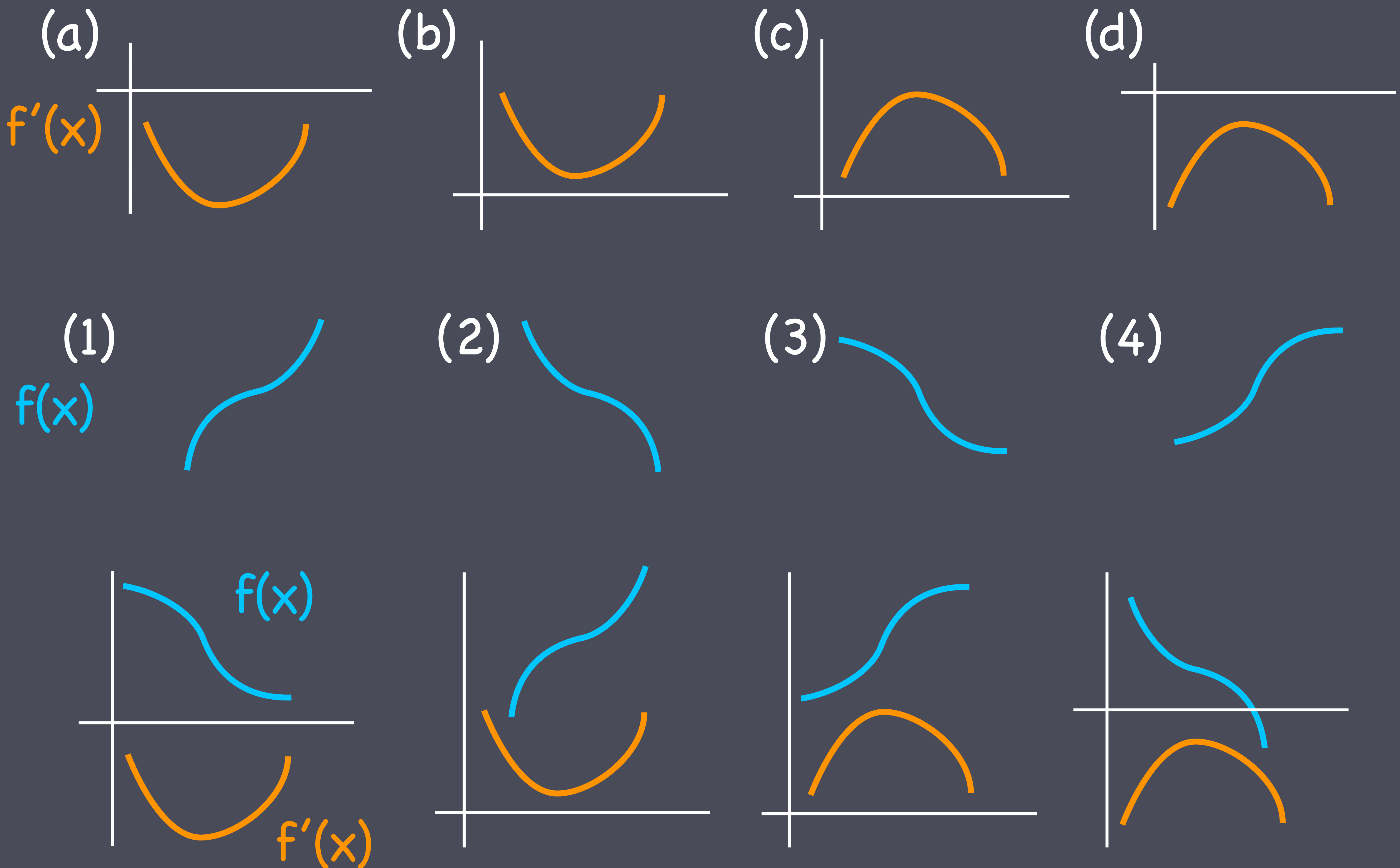

If you want to find a min/max of $f'(x)$, look for points at which. . .

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(D) $f''(x) = 0$ and $f'''(x) \neq 0$.

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

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- If $f''(x)$ does not change sign at a potential IP of $f(x)$, then the potential IP is not an IP of $f(x)$!

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- Use $f''(x)$ to determine intervals of concave up/down.

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- 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.

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

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(E) Don't know.

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

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

(E) Don't know.

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