

TUTORS: THIS IS A TAKE HOME QUIZ

Consider the following functions.

[1] $f(x) = x^6 e^{-3x}$

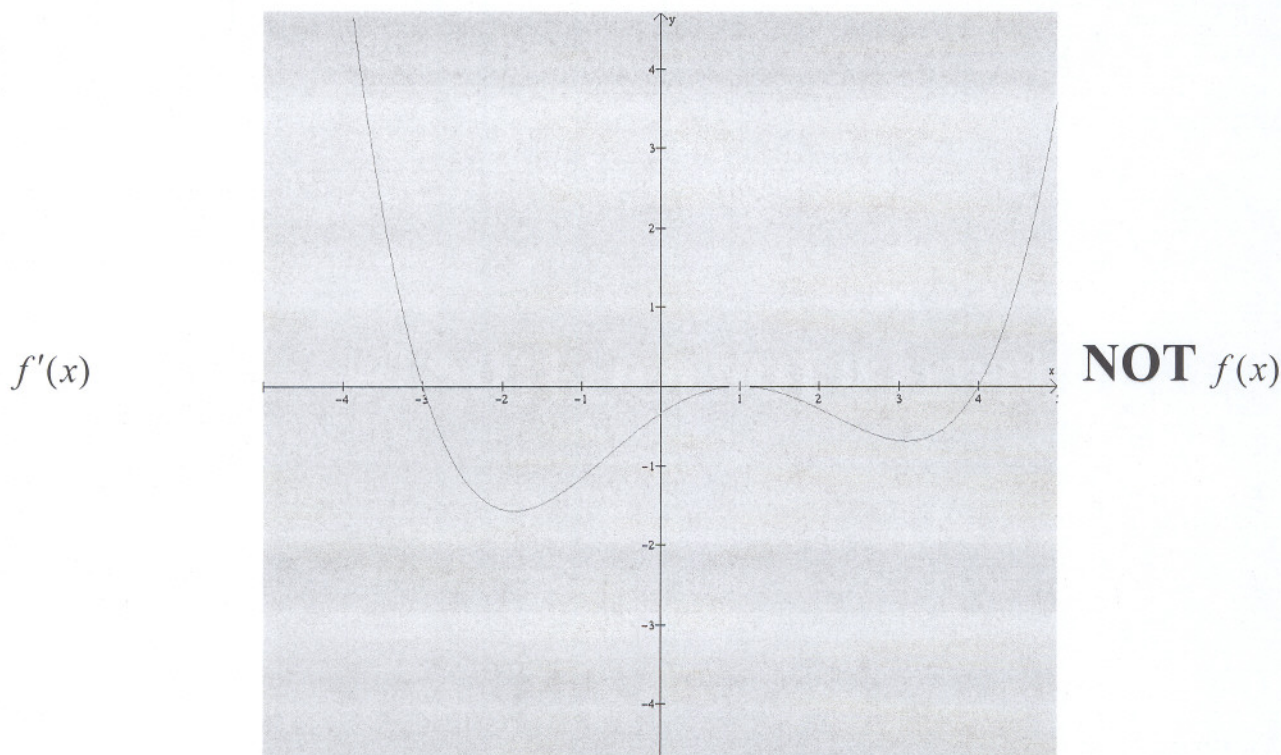
[2] $f(x) = x^{\frac{4}{3}} - 2x^{\frac{2}{3}}$

For each function,

- [a] find all critical numbers.
- [b] find the intervals over which the function is increasing / decreasing.
- [c] find the intervals over which the function is concave up / concave down.
- [d] what does the SECOND DERIVATIVE TEST tell you about each critical number you found ?
- [e] find all inflection points.

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The graph of $f'(x)$ is shown below. **NOTE: It is NOT the graph of $f(x)$.**



Answer the following questions about $f(x)$ without sketching $f(x)$. Explain very briefly why your answers are correct.

- [a] Estimate all critical numbers of $f(x)$.
- [b] Estimate the intervals over which $f(x)$ is increasing.
- [c] Estimate the intervals over which $f(x)$ is decreasing.
- [d] Estimate the x-coordinate(s) of all local minima of $f(x)$.
- [e] Estimate the x-coordinate(s) of all local maxima of $f(x)$.
- [f] Estimate the intervals over which $f(x)$ is concave up.
- [g] Estimate the intervals over which $f(x)$ is concave down.
- [h] Estimate the x-coordinate(s) of all inflection points of $f(x)$.

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