

YOUR NAME: _____

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Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Use the first derivative test to find the local extrema of the function $f(x) = 3x^4 + 8x^3 + 6x^2$.

2. Use the second derivative test to find the local extrema of the function $f(x) = \frac{x}{3} + \frac{3}{x}$.

3. Consider the function $f(x) = x^4 - 4x^3$.

(a) Compute the first derivative and find its critical points.

(b) Compute the second derivative and find its critical points.

(c) Create a combined sign table for the first and second derivatives and draw conclusions about the intervals of monotonicity, the relative extrema, the intervals of concavity and the inflection points of f .

(d) Sketch the graph of $y = f(x)$ based on the information gathered in Part (c).