Please show your work or line of reasoning.
An answer with no work or reasoning receives no credit.
You may use the back of a page if you need more space for a problem.
You may not use any calculators.

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1. (10 points) Find and simplify the linearization of the function given by $f(x) = x^{3/4}$ at $x = 81$. (Hint: $81 = 3^4$.)

2. (10 points) Find the derivative of the function given by $f(x) = x \sinh(x) - \cosh(x)$. 
3. In each part find the given limit if it exists; explain why if it does not.

(a) (10 points) \( \lim_{x \to \infty} x^2 e^{-x} = \)

(b) (10 points) \( \lim_{x \to 0} \frac{\cos(x) - 1 + x^2/2}{x^4} = \)
4. (10 points) Find all the critical points of the function given by \( h(t) = t^{1/3}(1 - t) \) and use this information to find the global minimum value and global maximum value of \( h \) on the interval \([0, 1]\).
5. Consider the function given by \( f(x) = x^4 - 4x^3 \).

(a) (10 points) Find the intervals of increase or decrease.

(b) (10 points) Find the local extremum points of \( f \) (if any).

(c) (10 points) Find the intervals of concavity and the inflection points of \( f \) (if any).
6. (20 points) Graph the function $f$ given the data below; label all local extremum points, inflection points, and asymptotes.

$f(0) = 0$;
$\lim_{x \to -\infty} f(x) = 1$ and $\lim_{x \to \infty} f(x) = 3$;
$f'(x) > 0$ for $(-\infty, -2), (0, 2)$, and $(2, \infty)$;
$f'(x) < 0$ for $(-2, 0)$;
$f''(x) > 0$ for $(-\infty, -3), (-1, 1)$ and $(2, 3)$; and
$f''(x) < 0$ for $(-3, -1), (1, 2)$ and $(3, \infty)$. 