

Fall 2025

MATH ~~007~~A: Calculus for Life Sciences I

Final Review

Make sure to review the problems from both the Midterm 1 and Midterm 2 exams, as well as their corresponding review materials. The final exam will include problems analogous in style and content to several from those earlier assessments.

Problem 1. Find the global maximum and minimum of the function $f(x) = 27x - x^3$ on the closed interval $[-4, 0]$.

Problem 2. We continue working with the function $f(x) = 27x - x^3$.

(a) Compute the average rate of change in $f(x)$ between $x = -4$ and $x = 0$.

(b) Find all numbers $-4 < c < 0$ with $f'(c)$ equal to the number you found in (a).

Problem 3. Consider the function $f(x) = 2 - 12x + x^3$.

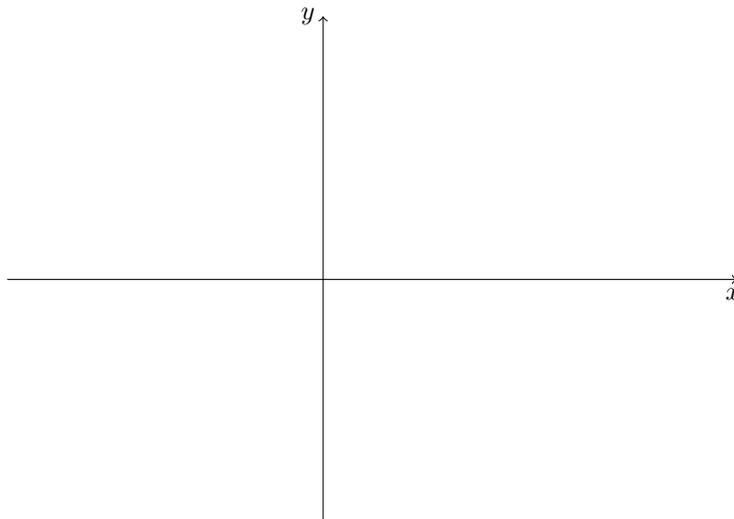
(a) Find the intervals on which $f(x)$ is increasing or decreasing.

(b) Find the critical point(s) of $f(x)$ and classify each as a local maximum, local minimum, or neither. Write each point of local max/min as an ordered pair (x, y) .

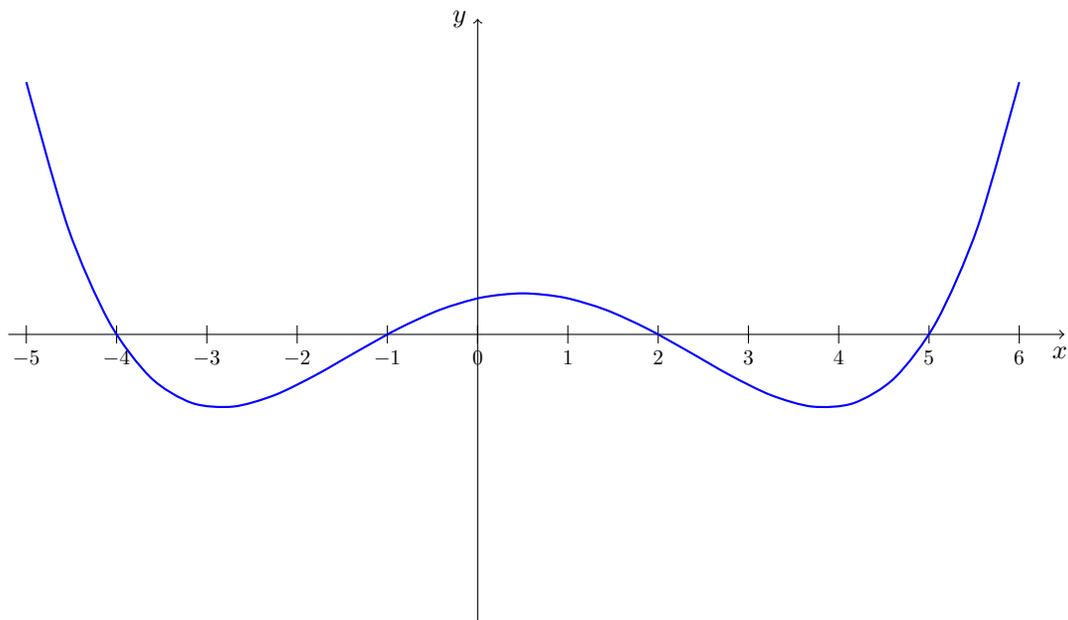
(c) Find the intervals on which $f(x)$ is concave up or concave down.

(d) Find all points of inflection of f . Write each point as an ordered pair (x, y) .

(e) Sketch the graph of $f(x)$ on the axes provided below. Label extrema and inflection point(s).



Problem 4. The graph below shows the **derivative** $f'(x)$ of a function $f(x)$. Use the graph to estimate the x -coordinates of all inflection points of $f(x)$.



Problem 5. Use L'Hôpital's Rule to evaluate the following limits:

$$(a) \lim_{x \rightarrow 0} \frac{e^{5x} - 1}{x}$$

$$(b) \lim_{x \rightarrow \infty} \frac{\ln(x)}{x}$$

$$(c) \lim_{x \rightarrow 0} \frac{x^2}{1 - \cos(x)}$$