

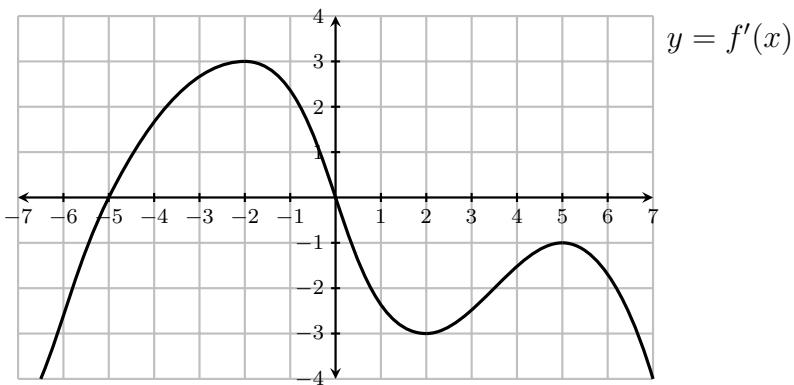
Name: _____

TEST 3 MATH 200
November 7, 2025

1. Evaluate the limits.

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

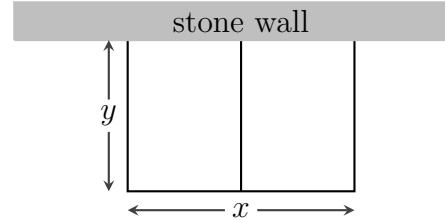
(b) $\lim_{x \rightarrow \infty} 3xe^{-2x} =$

2. The graph of **the derivative** $f'(x)$ of a function $f(x)$ is shown. Answer the questions about $f(x)$.

- What are the critical points of $f(x)$?
- On what intervals is $f(x)$ decreasing?
- State the locations (x values) of any local minima of $f(x)$.
- State the locations (x values) of any local maxima of $f(x)$.
- State the locations (x values) of any inflection points of $f(x)$.

3. Find the absolute extrema of $f(x) = x^3(x - 2)^3$ on $[1, 3]$.

4. You have a 300 feet of chain link fence to enclose two rectangular pens formed along a stone wall, as illustrated. No fencing is needed along the stone wall. What dimensions (i.e. x feet by y feet) yield the greatest total enclosed area?



5. The questions on this page are about the function $f(x) = x^3 - 9x^2 + 24x - 1$.

(a) Find the intervals on which $f(x)$ increases and on which it decreases.

(b) Find and identify the local extrema. (Their x values will suffice.)

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

(d) State the locations of all inflection points of $f(x)$. (Their x values will suffice.)

(e) Find and identify the global extrema of $f(x)$ on the interval $(3, 6)$.