

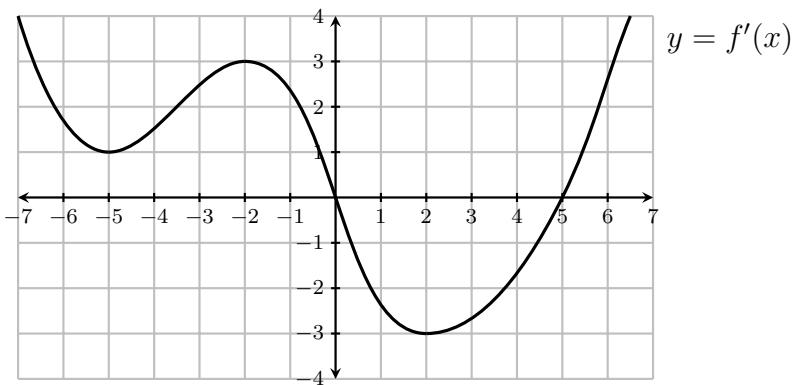
Name: \_\_\_\_\_

TEST 3 MATH 200  
November 7, 2025

1. Evaluate the limits.

(a)  $\lim_{x \rightarrow \infty} 4xe^{-3x} =$

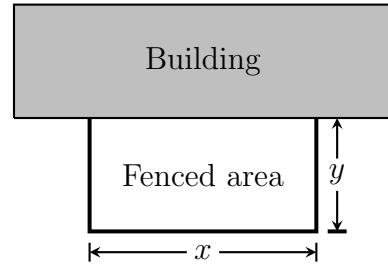
(b)  $\lim_{x \rightarrow 0} \frac{x^2}{1 - \cos(x)} =$

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  $f(x) = x^2(x - 3)^4$  on  $[2, 4]$ .

4. You have 160 feet of fencing material to enclose a rectangular region. One side borders a building, so no fencing is required for that side. Find the dimensions  $x$  and  $y$  that maximize the fenced area.



5. The questions on this page are about the function  $f(x) = \frac{1}{3}x^3 - 4x^2 + 12x + 1$ .

(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  $(1, 5)$ .