

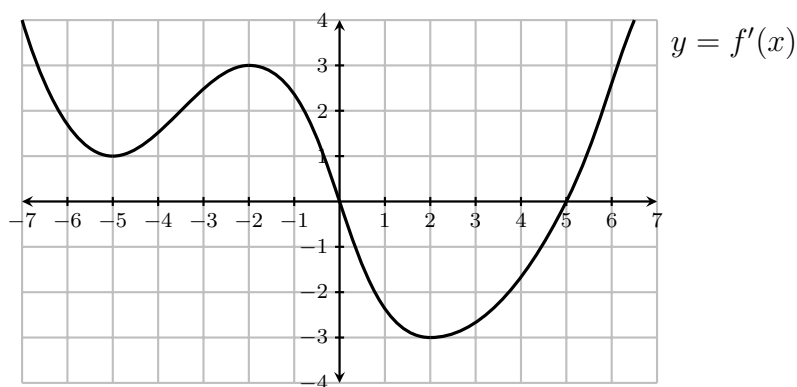
Name: _____

1. Evaluate the limits.

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

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

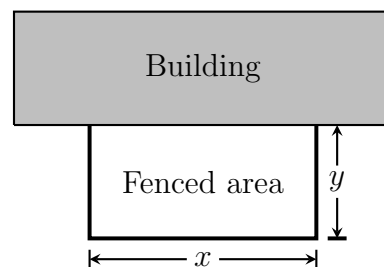
2. The graph of **the derivative** $f'(x)$ of a function $f(x)$ is shown. Answer the questions about $f(x)$.



- (a) What are the critical points of $f(x)$?
- (b) On what intervals is $f(x)$ decreasing?
- (c) State the locations (x values) of any local minima of $f(x)$.
- (d) State the locations (x values) of any local maxima of $f(x)$.
- (e) 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 $(1, 5)$.