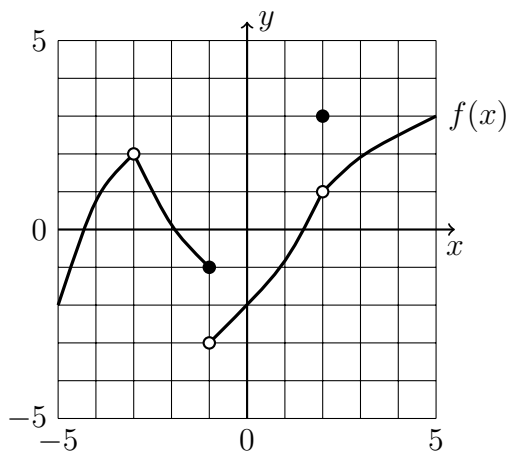


Math 231 Calculus 1 Fall 14 Sample Midterm 1

- (1) The graph of $y = f(x)$ is shown below. Evaluate each limit, or write DNE if the limit does not exist. No justifications are necessary.



- (a) $\lim_{x \rightarrow -3} f(x)$
 (b) $\lim_{x \rightarrow -1^-} f(x)$
 (c) $\lim_{x \rightarrow -1^+} f(x)$
 (d) $\lim_{x \rightarrow -1} f(x)$
 (e) $\lim_{x \rightarrow 2} f(x)$
 (f) $\lim_{x \rightarrow 3} f(x)$

- (2) Evaluate these limits. For an infinite limit, write $+\infty$ or $-\infty$. If a limit does not exist (DNE), you must justify why this is the case.

- (a) $\lim_{x \rightarrow -1} \frac{3x^2 + 4x + 1}{x + 1}$
 (b) $\lim_{x \rightarrow 3} \frac{\sqrt{x + 1} - 2}{x - 3}$
 (c) $\lim_{x \rightarrow 0} \frac{\sin 4x}{\sin 3x}$
 (d) $\lim_{x \rightarrow 0} \left(\frac{1}{3x} - \frac{1}{x(x + 3)} \right)$

- (3) Sketch the graph of a function which is negative but increasing, and for which $\lim_{x \rightarrow \infty} f(x) = 0$ and $\lim_{x \rightarrow -\infty} f(x) = -4$. Sketch its derivative.

- (4) Find the horizontal asymptotes of

$$f(x) = \frac{2x^2 - 1}{\sqrt{6 + x^4}}.$$

- (5) For a sphere of radius r , its surface area $S = 4\pi r^2$. What is the average rate of change of the surface area when the radius increases from $r = 4$ to $r = 5$?
- (6) Show that $e^x = 1/x^2$ has a solution for some $x > 0$. You do not need to find this solution.
- (7) Use the limit definition of the derivative to evaluate $f'(2)$, where

$$f(x) = \frac{1}{\sqrt{x+3}}.$$

- (8) Use the definition of the derivative to find the derivatives of the following functions.
- (a) $f(x) = -2x^2 + x + 1$
- (b) $f(x) = \frac{1}{x-2}$
- (c) $f(x) = \sqrt{x+2}$