

Math 135: Exam 1 Review

For exercise 1-5, graph each function and then find the specified limits. When necessary, state that the limit does not exist.

1. $F(x) = \frac{1}{x-3}$; Find $\lim_{x \rightarrow 3} F(x)$ and $\lim_{x \rightarrow 4} F(x)$.

2. $f(x) = \frac{1}{x} - 2$; Find $\lim_{x \rightarrow \infty} f(x)$ and $\lim_{x \rightarrow 0} f(x)$.

3. $F(x) = \begin{cases} 2x + 1, & \text{for } x < 1, \\ x, & \text{for } x \geq 1 \end{cases}$; Find $\lim_{x \rightarrow 1^-} F(x)$, $\lim_{x \rightarrow 1^+} F(x)$, and $\lim_{x \rightarrow 1} F(x)$.

4. $g(x) = \begin{cases} -x + 3, & \text{for } x < 3, \\ x - 3, & \text{for } x > 3 \end{cases}$; Find $\lim_{x \rightarrow 3^-} g(x)$, $\lim_{x \rightarrow 3^+} g(x)$, and $\lim_{x \rightarrow 3} g(x)$.

5. $f(x) = |x|$; Find $\lim_{x \rightarrow 0} f(x)$ and $\lim_{x \rightarrow -2} f(x)$.

6. Is the function given by $f(x) = 3x - 2$ continuous at $x = 4$? Why or why not?

7. Is the function given by

$$f(x) = \begin{cases} \frac{1}{2}x + 1 & \text{for } x < 4, \\ -x + 7 & \text{for } x \geq 4. \end{cases}$$

continuous at $x = 4$? Why or why not?

8. Is the function given by

$$F(x) = \begin{cases} \frac{1}{3}x + 4, & \text{for } x \leq 3, \\ 2x - 5, & \text{for } x > 3. \end{cases}$$

continuous at $x = 3$? Why or why not?

9. In t seconds, an object dropped from a certain height will fall $s(t)$ feet, where

$$s(t) = 16t^2$$

a. Find $s(5) - s(3)$.

b. What is the average rate of change of distance with respect to time during the period from 3 to 5 sec? (Hint: This is also known as average velocity.)

10. At the beginning of a trip, the odometer on a car reads 30,680, and the car has a full tank of gas. At the end of the trip, the odometer reads 31,077. It takes 13.5 gal of gas to refill the tank.

a. What is the average rate at which the car was traveling, in miles per gallon?

b. What is the average rate of gas consumption in gallons per mile?

For Exercise 11 and 12:

a. Find $f'(x)$ by determining the difference quotient $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$.

b. Find $f'(-2)$, $f'(0)$, and $f'(1)$.

11. $f(x) = -2x^2$

12. $f(x) = 2x + 3$