

1. Find the following limits.

(a) $\lim_{x \rightarrow -1} \frac{x^2 + 2x + 1}{x^2 - 5}$

(b) $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x^2 - 5x + 6}$

(c) $\lim_{x \rightarrow 3^-} \frac{x + 2}{x - 3}$

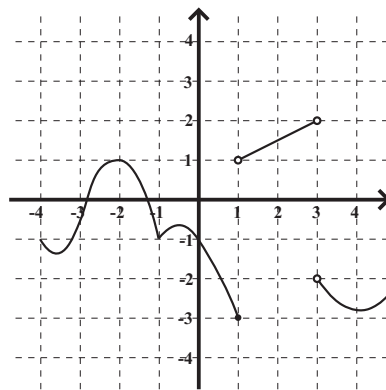
(d) $\lim_{x \rightarrow 3^-} \frac{x^2 - 9}{|x - 1| - 2}$

(e) $\lim_{x \rightarrow 1^+} \frac{x^2 - 4x + 3}{|1 - x|}$

(f) $\lim_{z \rightarrow 4} \frac{4 - z}{2 - \sqrt{z}}$

2. Suppose a car is moving, and at time t measured in seconds, the car's position is $p(t) = 4t + t^2$ in feet.

- (a) What is the car's average velocity between $t = 3$ sec and $t = 4$ sec?
- (b) What is the car's average velocity between $t = 2.9$ sec and $t = 3$ sec?
- (c) **Without using formulas from physics or calculus**, how would you figure out the velocity of the car at $t = 3$ sec? Implement this method.



3. Above is the graph of the function $g(x)$. Find the following limits.

(a) $\lim_{x \rightarrow -1} g(x)$

(b) $\lim_{x \rightarrow 3} g(x)$

(c) $\lim_{x \rightarrow 3} (g(x))^2$

(d) $\lim_{t \rightarrow 2} \frac{g(t) - \frac{3}{2}}{t - 2}$

Hint. We have taken a few limits that look kind of like this. What were we computing?

(e) $\lim_{t \rightarrow -2} \frac{g(t) - 1}{t + 2}$

Hint. See previous hint.

4. Let

$$f(x) = \begin{cases} x^2 & \text{when } x \geq 2 \\ ax - 2 & \text{when } -1 \leq x < 2 \\ b - x^2 & \text{when } x < -1 \end{cases}$$

For what values of a and b is $f(x)$ continuous everywhere?

5. (a) Does $x^3 - 3x + 1 = 7$ have a solution in the interval $(1, 3)$?
- (b) Does $\frac{x+5}{x-2} = 0$ have a solution in the interval $(1, 3)$?
- (c) Does either of the previous answers disagree with the Intermediate Value Theorem?