# Limits and Continuity

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# Contents

# Chapter 1

- A function's limit can be one of it's own outputs. When this happens the function called a continuous function.
- A Limit of a function is not necessarily one of the function's output values.
- A Limit of a function can be one of the function values.

$$\lim_{x \to a} f(x) = f(a)$$

If a limit can be found at $x = a$ then we can say this function is continuous as $x = a$

This means for a function to be continuous at $x = a$

- $f(a)$ must exist
- $\lim_{x \to a} f(x)$ must exist
- $\lim_{x \to a} f(x) = f(a)$

### 1.0.1 Checking continuity graphically

A graph with no breaks is continuous. Graphically a continuous function should have none of the following

- Holes - Holes in a graph are called removable discontinuity, because they can be determined by studying neighbouring values using Limits.
- Jumps, due to a sudden change in values.

$$f(x) = \begin{cases} x^2, & \text{if } x < 1 \\ x + 4, & \text{if } x \geqslant 1 \end{cases}$$