

Statements

$x > y \Rightarrow x \geq y$. (True!) ^{implies}

" x is an even number" \leftarrow stronger statement
vs " x is an integer"

"Suppose $f: X \rightarrow \mathbb{R}$ is a differentiable function. If x^* maximises f , then $f'(x^*) = 0$." **If A, then B implies C.**

Converse: If $f'(x^*) = 0$, then x^* maximises f . (false!)

contrapositive: If $f'(x^*) \neq 0$, then x^* does not maximise f . **not C implies not B.**

if and only if: $f'(x^*) = 0$ iff x^* maximises f .

(false)

Negation: of $x = y$ is $x \neq y$.

BS Quantifiers

" x is an even number" **true or false?**

" $\cos^2 x + \sin^2 x = 1$ for all $x \in \mathbb{R}$."

"there exists some $x \in \mathbb{R}$ such that $\sin x = 1$."
for every, for any
there is some, there is, for some

(i) For all criminals c , there exists a punishment p such that the criminal c would be deterred from crime.

(ii) There exists a punishment p such that all criminals c would be deterred from crime

B6 Theorems and Proofs

"Do you agree that the British Empire was a force for a good?"

"Prove that if the maximum of a set exists, then it equals its supremum."

\square QED \leftarrow end of a proof

∇ \leftarrow end of a proof by contradiction.