INT201 Decision, Computation and Language

Tutorial 1

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Constructive proof

A method of proof that demonstrates the existence of a mathematical object (anything that has been formally defined) by creating or providing a method for creating the object.

Example

There exists an object with property $\mathcal{P}$.

Proof. Here is the object: [...]
And here is the proof that the object satisfies property $\mathcal{P}$: [...]

Constructive proof

Example

Theorem 1.3.5 *For every even integer $n \geq 4$, there exists a 3-regular graph with n vertices.*

Nonconstructive proof

In a nonconstructive proof, we show that a certain object exists, without actually creating it.

Example

Theorem 1.3.6 *There exist irrational numbers x and y such that x^y is rational.*

Proof by Contradiction

A form of proof that establishes the truth or the validity of a proposition, by showing that assuming the proposition to be false leads to a contradiction

Example

Theorem 1.3.7 *Statement $\mathcal{S}$ is true.*

Proof. Assume that statement $\mathcal{S}$ is false. Then, derive a contradiction (such as $1 + 1 = 3$).

Example

Theorem 1.3.8 *Let n be a positive integer. If n^2 is even, then n is even.*

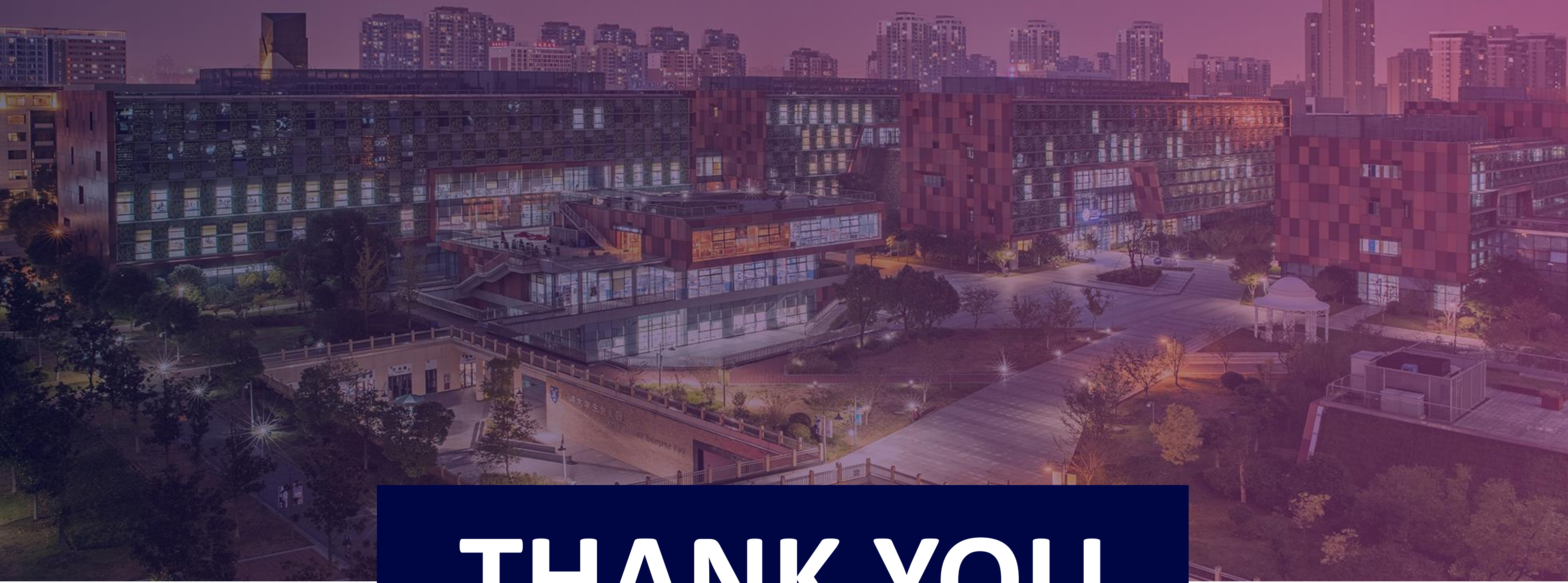
Proof by Induction

A mathematical proof technique. It is essentially used to prove that a statement P(n) holds for every natural number n = 0, 1, 2, 3, ... ;

Example

For all positive integers n, we have

$$1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}.$$



THANK YOU

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