Some Big Ideas, Week 5
Feb 16 − Feb 20, 2026

⊙ **Principle of Mathematical Induction:**

Let $P(n)$ be a property that is defined for integers n. Let a be a fixed integer.

Suppose the following two statements are true:

1. $P(a)$ is true.
2. $\forall k \geq a$, if $P(k)$ is true, then $P(k+1)$ is true.

Then $\forall n \geq a$, $P(n)$ is true.

⊙ **General structure of a Proof by Induction:**

Start by giving the statement that you want to prove:

Let $P(n)$ be the statement . . .

To prove $P(n)$ is true for all $n \geq a$, requires two steps:

1. **Base case:** Prove that $P(a)$ is true.

2. **Inductive case:** Assume that $P(k)$ is true, and prove that $P(k+1)$ is true.
   "$P(k)$ is true" is called the **inductive hypothesis**.

If you successfully proved both results, then you can conclude

Thus, by the principle of mathematical induction, $P(n)$ is true $\forall n \geq a$.

Check the **Tentative Weekly Syllabus** on the course webpage for the specific sections relevant for this week.