CIS 160 Recitation #4

Induction, Binomial Theorem, Pigeonhole Principle

Induction Review

Let $P(n)$ be a predicate whose truth depends on n.

We want to prove that $P(n)$ is true for all integers n greater than or equal to some integer n_0 .

Base Case: Show $P(n_0)$ is true.

Induction Hypothesis: Assume $P(k)$ is true for some integer $k \geq n_0$

Induction Step: Using this assumption, prove that $P(k+1)$ is true.

Binomial Theorem

For any real numbers a and b and non-negative integer n

$$(a+b)^n = \sum_{k=0}^{n} \binom{n}{k} a^{n-k} b^k$$

Pigeonhole Principle

- If $k+1$ objects are distributed into k bins, there will be at least one bin with at least 2 objects
- Generalized PHP: If n objects are distributed into k bins, there will be at least one bin with at least $\lceil \frac{n}{k} \rceil$ objects

- When using PHP, cite it and describe what your “pigeons” (objects) are and what your “holes” (bins) are
- Tip: often a good technique for problems asking you to prove existence (look for “there exists”)