

## Big picture Solve problems Given a definition put it in context of existing knowledge prove things about it Be able to use common strategies break it down in a structured way decide whether/how to simplify decide if general techniques can be applied and, if so, how Determine if it can be solved efficiently understand the role of heuristics understand the role of implementation Collaborate and communicate

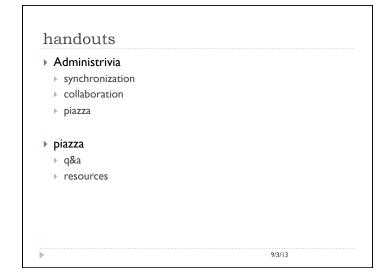
## Prerequisites/assumptions Proficiency with: proof techniques Experience with: high-level programming language counting graphs and trees Exposure to: big-O notation ID/2D arrays sorting (one O(n²) sort) basic matrix/vector operations sequential vs. random memory access

two conjectures

• all primes are odd

• if p is prime, then 2P-1 is prime

## Proof techniques by example/counterexample by enumeration by cases by inference (aka direct proof) trivially by the contrapositive by contradiction by (weak) induction all primes are odd if p is prime, then 2<sup>p</sup>-1 is prime y/3/13

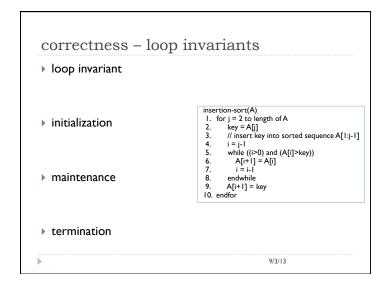


f(n) is O(g(n)) if there exist positive constants c and n<sub>0</sub> such that f(n) ≤ cg(n) for all n>n<sub>0</sub>
 Show that f(n)=120n²-11n+250 is O(n²)
 Show that f(n)=n³ is O(n²)

more asymptotics  $\Omega \text{ (big-Omega)}$   $f(n) \text{ is } \Omega \text{ (g(n)) if there exist positive constants c and } n_0 \text{ such that } f(n) \geq \text{cg(n) for all } n > n_0$   $f(n) \text{ is } \Omega \text{ (g(n)) if there exists a positive constant c such that } f(n) \geq \text{cg(n) for an infinite number of n}$   $\theta \text{ (Theta)}$   $\omega \text{ (little-omega)}$  0 (little-o)

Describe (in English sentences) how you would arrange a set of 10 dates in "ascending sorted order", that is, from earliest to latest. You might consider the following list of dates, but make sure that you describe how to do it with any 10 dates.

December 21, 2010
May 1, 1988
July 21, 1970
August 28, 2001
January 31, 2002
June 6, 2010
May 20, 1988
November 5, 1970
April 2, 1999
September 9, 2002



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