Lecture 7

CSE 331

Sep 10, 2014

Read the rubric for HW 1

note

stop following 63 views

Actions

Homework 1 initial Grading Rubric

(Am pinning this post up till the deadline on Friday. --Atri)

The stuff below meant to illustrate how much points each part of the solution is worth
Follow the answer format provided here :

Problem 1 : (Exercise 1 & 2 in Chapter 1)

Statement : True (T) or False (F).
Choose True or False Correctly. .... (4 points).
If you choose True or False incorrectly, you will get **zero** in both **Proof Idea** and **Proof Detail** part.

Proof idea:
Here express clearly why you think it is True or False. Then explain how you are going to prove or disprove the statement. ... .
(6 points)

Proof details:
Here provide the proof if you choose True, otherwise provide (details of) a counterexample to disprove the statement. Note that a

Please review posted questions before posting yours


note

stop following

1 views

Please read previous posts before posting your question

Hi guys,

I am really glad that you guys are asking questions: this is great!

However, there have been multiple questions now that have been already answered in a previous post. So please check existing posts **first** to make sure your question has not been answered already. If not, please go ahead and feel free to ask your question. If you see an answer that is related but does not quite answer your question, post a followup question on the earlier post.

Having too many posts with the same question just clutters the feed.

So please do keep your questions coming, but first verify if they have already been answered.

Thanks!
Atri

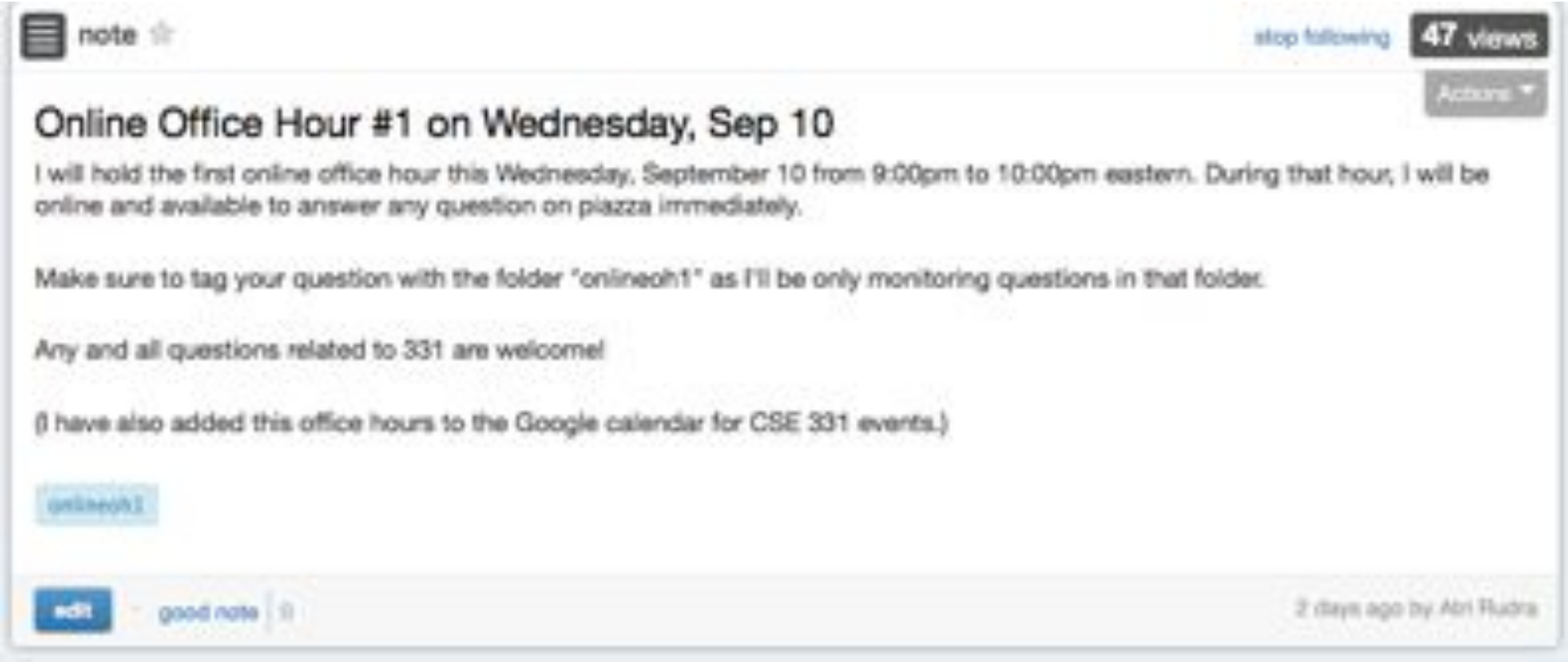
homework 1

edit · good note | 0

23 seconds ago by Atri Rudra

Online Office Hours

Tonight: 9:00pm to 10:00pm



Gale-Shapley Algorithm

Intially all men and women are free

While there exists a free woman who can propose

Let w be such a woman and m be the best man she has not proposed to

w proposes to m

If m is free

(m,w) get engaged

Else (m,w') are engaged

If m prefers w' to w

w remains free

Else

(m,w) get engaged and w' is free

Output the engaged pairs S as the final output

Observation 1

Intially all men and women are free

While there exists a free woman who can propose

Let w be such a woman and m be the best man she has not proposed to

w proposes to m

If m is free

(m,w) get engaged

Else (m,w') are engaged

If m prefers w' to w

w remains free

Else

(m,w) get engaged and w' is free

Once a man gets engaged, he remains engaged (to "better" women)

Output the engaged pairs S as the final output

Observation 2

Intially all men and women are free

While there exists a free woman who can propose

Let w be such a woman and m be the best man she has not proposed to

w proposes to m

If m is free

(m,w) get engaged

Else (m,w') are engaged

If m prefers w' to w

w remains free

Else

(m,w) get engaged and w' is free

If w proposes to m after m', then she prefers m' to m

Output the engaged pairs S as the final output

Proof via "progress"

Intially all men and women are free

While there exists a free woman who can propose

Let w be such a woman and m be the best man she has not proposed to

w proposes to m

If m is free

(m,w) get engaged

Else (m,w') are engaged

If m prefers w' to w

w remains free

Else

(m,w) get engaged and w' is free

End of iteration t, define progress P(t) s.t.:

1. $1 \le P(t) \le n^2$
2. $P(t+1) = P(t)+1$

Output the engaged pairs as the final output

Today's lecture

GS algorithms always outputs a stable marriage

The Lemmas

Lemma 1: The GS algorithm has at most n^2 iterations

Lemma 2: S is a perfect matching

Lemma 3: S has no instability

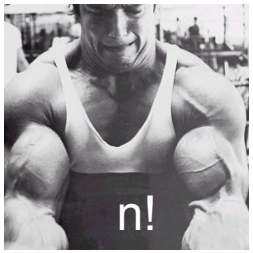
Questions/Comments?

Extensions

Fairness of the GS algorithm

Different executions of the GS algorithm

Main Steps in Algorithm Design



Problem Statement

Problem Definition

Algorithm

"Implementation"

Analysis

Correctness Analysis

Definition of Efficiency

An algorithm is efficient if, when implemented, it runs quickly on real instances

Implemented where?

Platform independent definition

What are real instances?

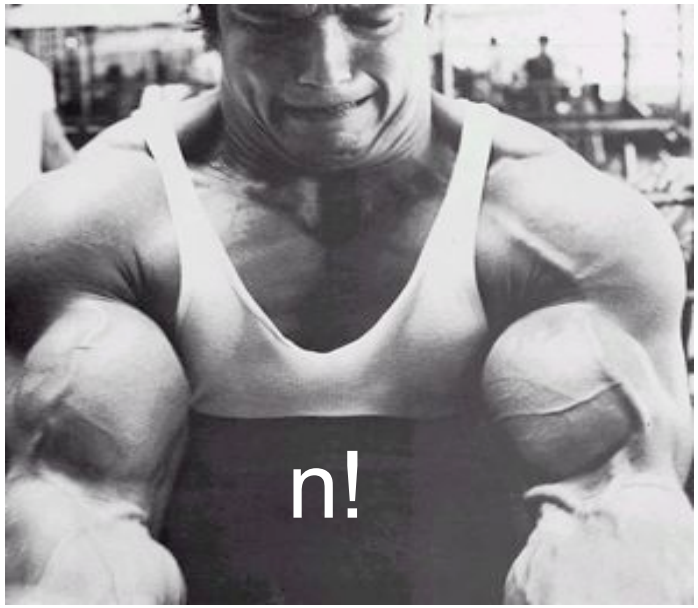
Worst-case Inputs

Efficient in terms of what?

$N = 2n^2$ for SMP

Input size N

Definition-II



Analytically better than brute force

How much better? By a factor of 2?

Definition-III

Should scale with input size

If N increases by a constant factor, so should the measure

Polynomial running time

At most $c \cdot N^d$ steps ($c>0$, $d>0$ absolute constants)

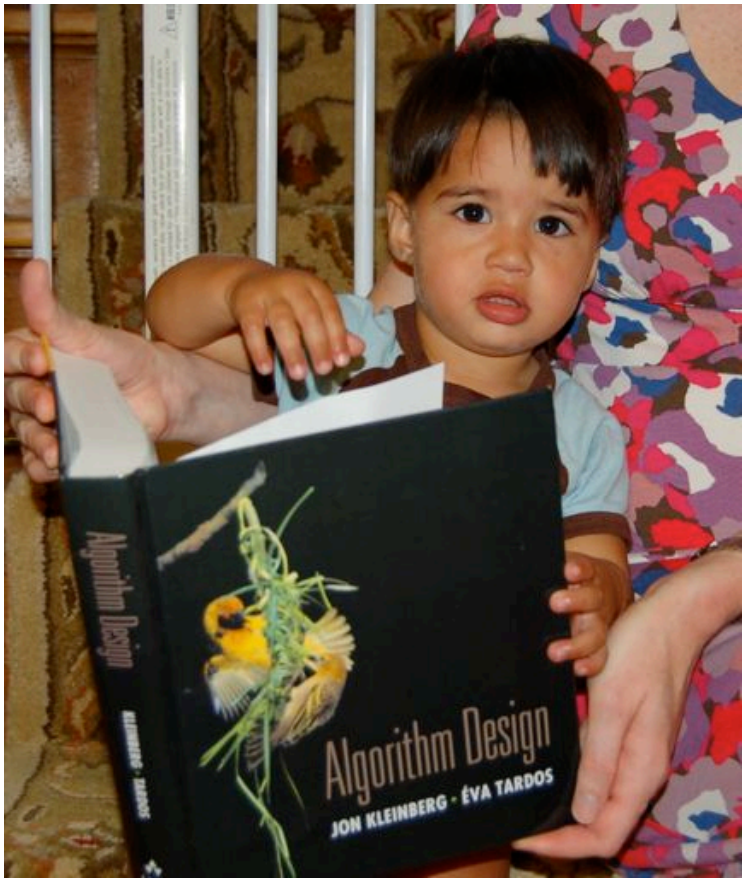
Step: “primitive computational step”

More on polynomial time

Problem centric tractability

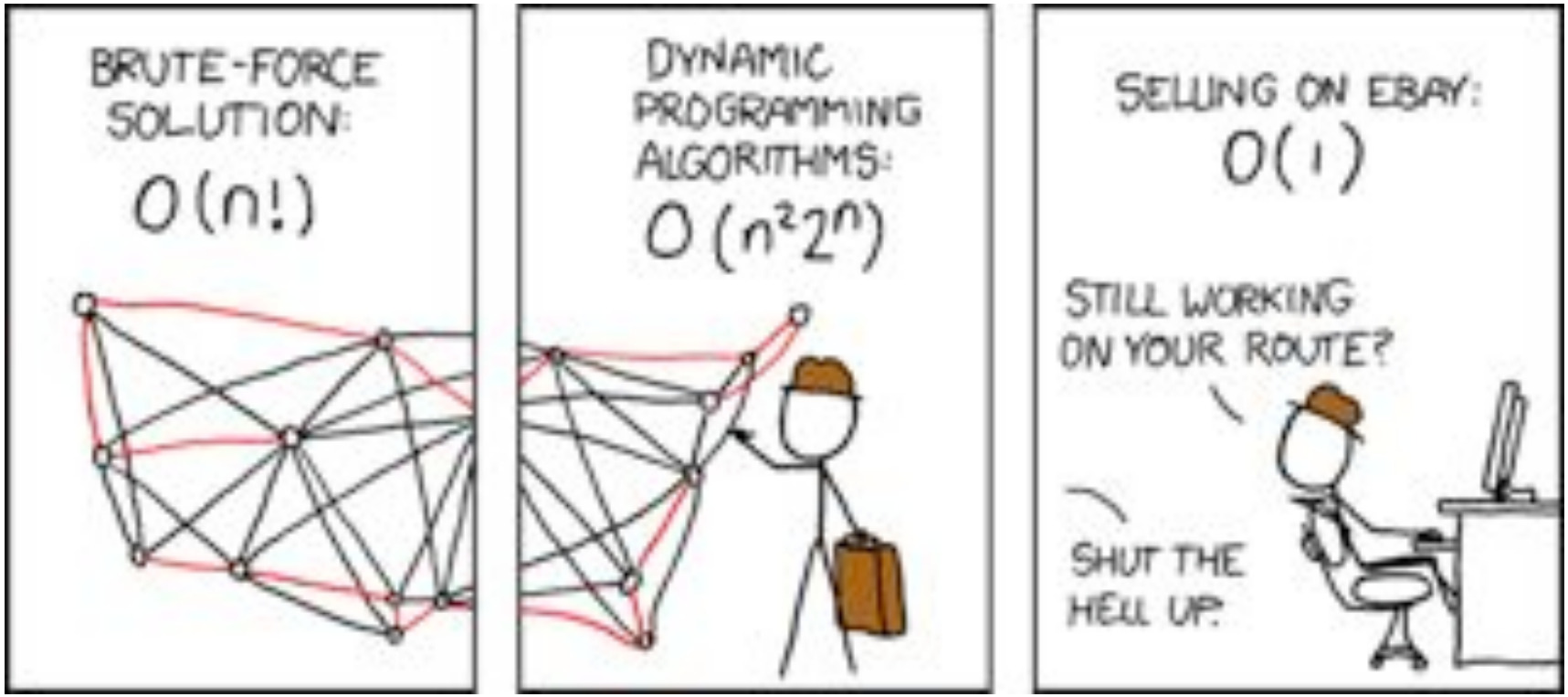
Can talk about problems that are not efficient!

Reading Assignments



Sections 1.2, 2.1, 2.2 and 2.4 in [KT]

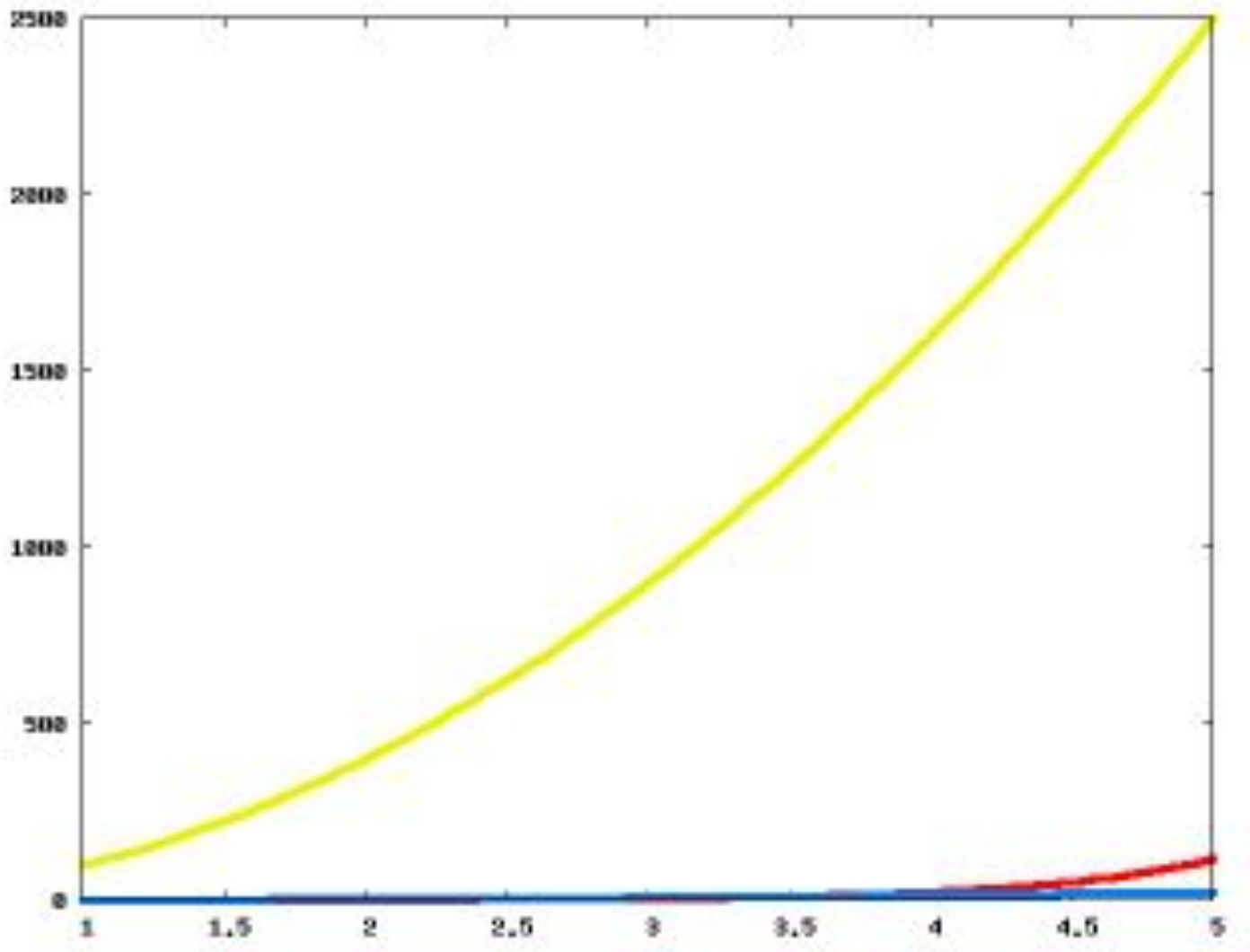
Asymptotic Analysis



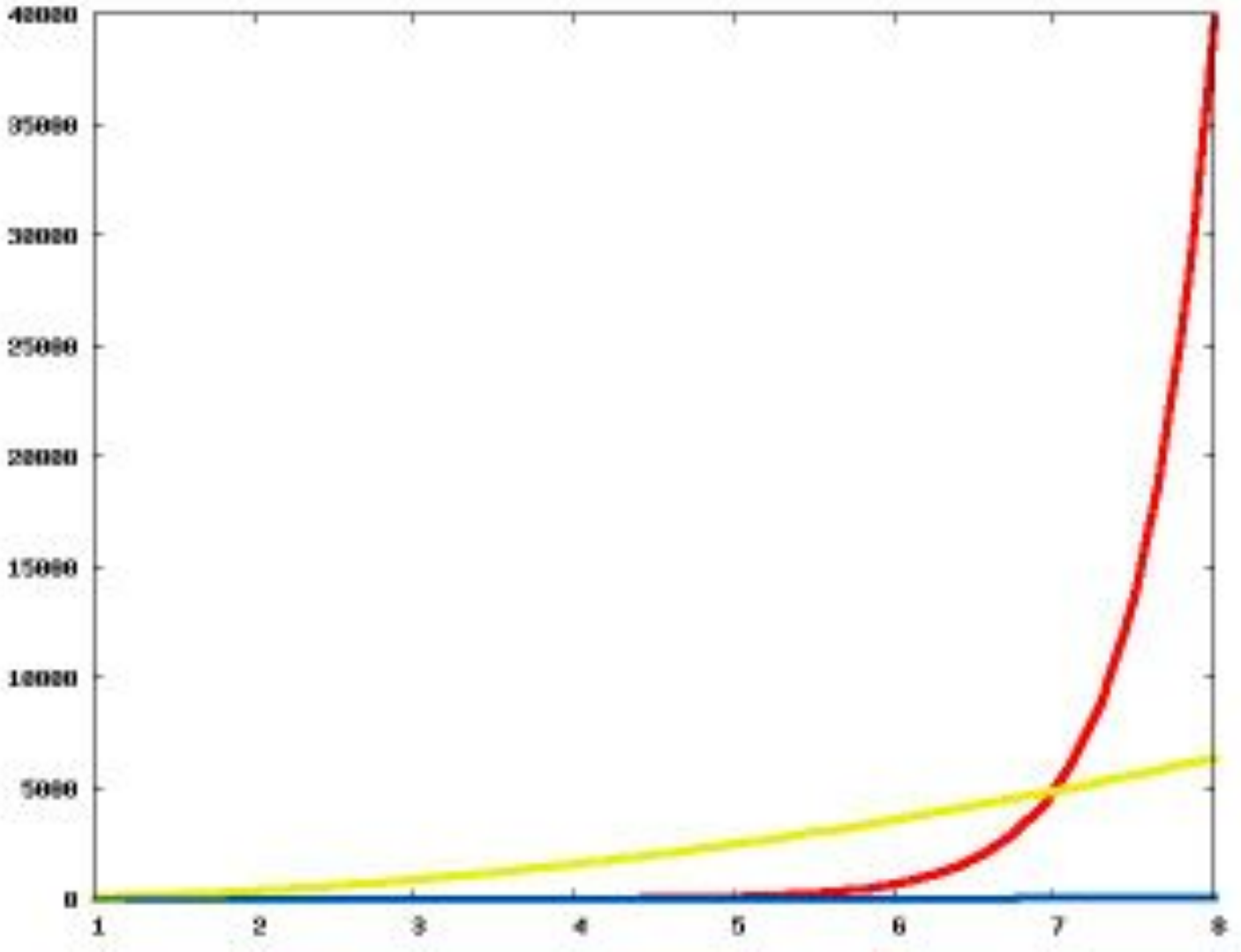
Travelling Salesman Problem

(http://xkcd.com/399/)

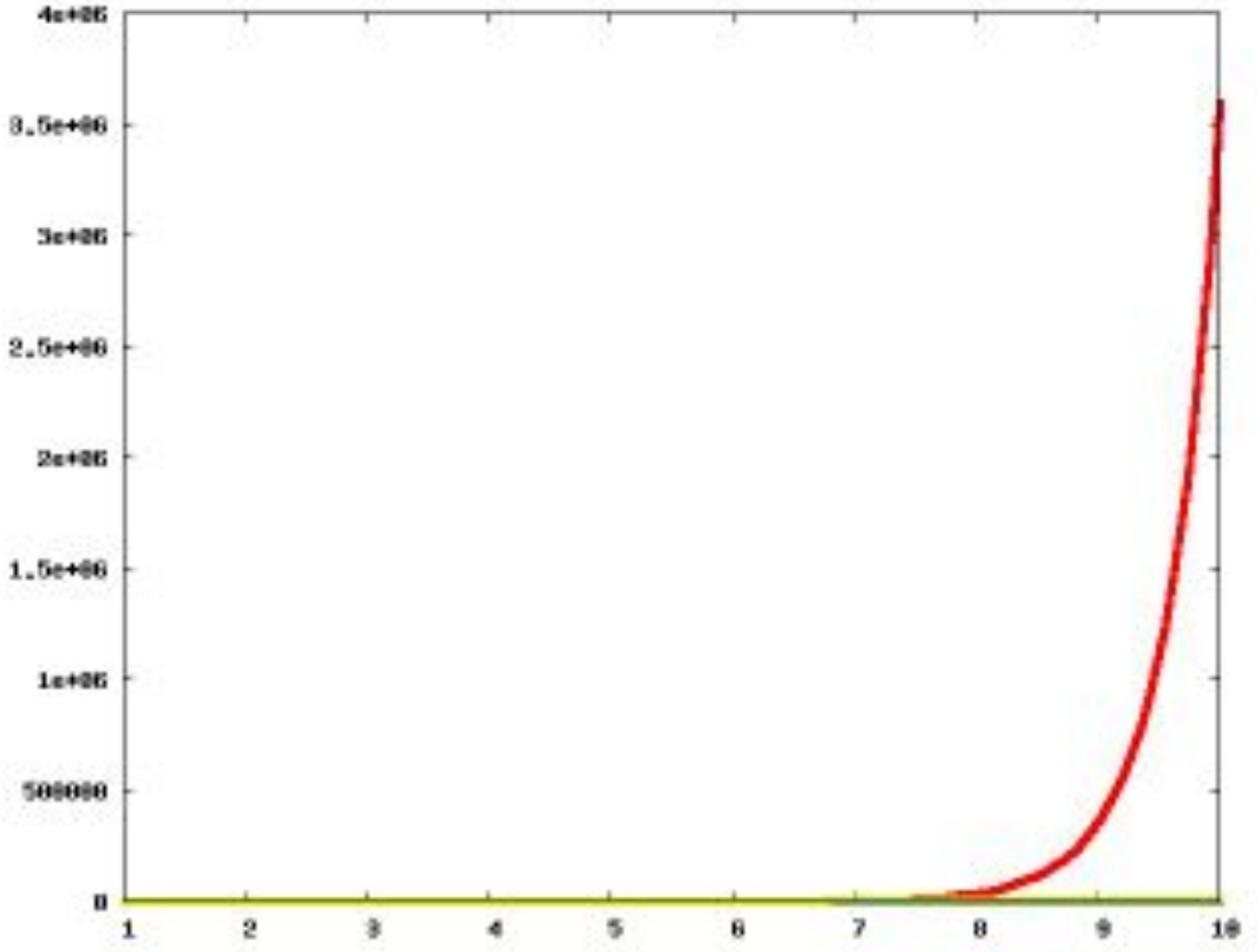
Which one is better?



Now?



And now?

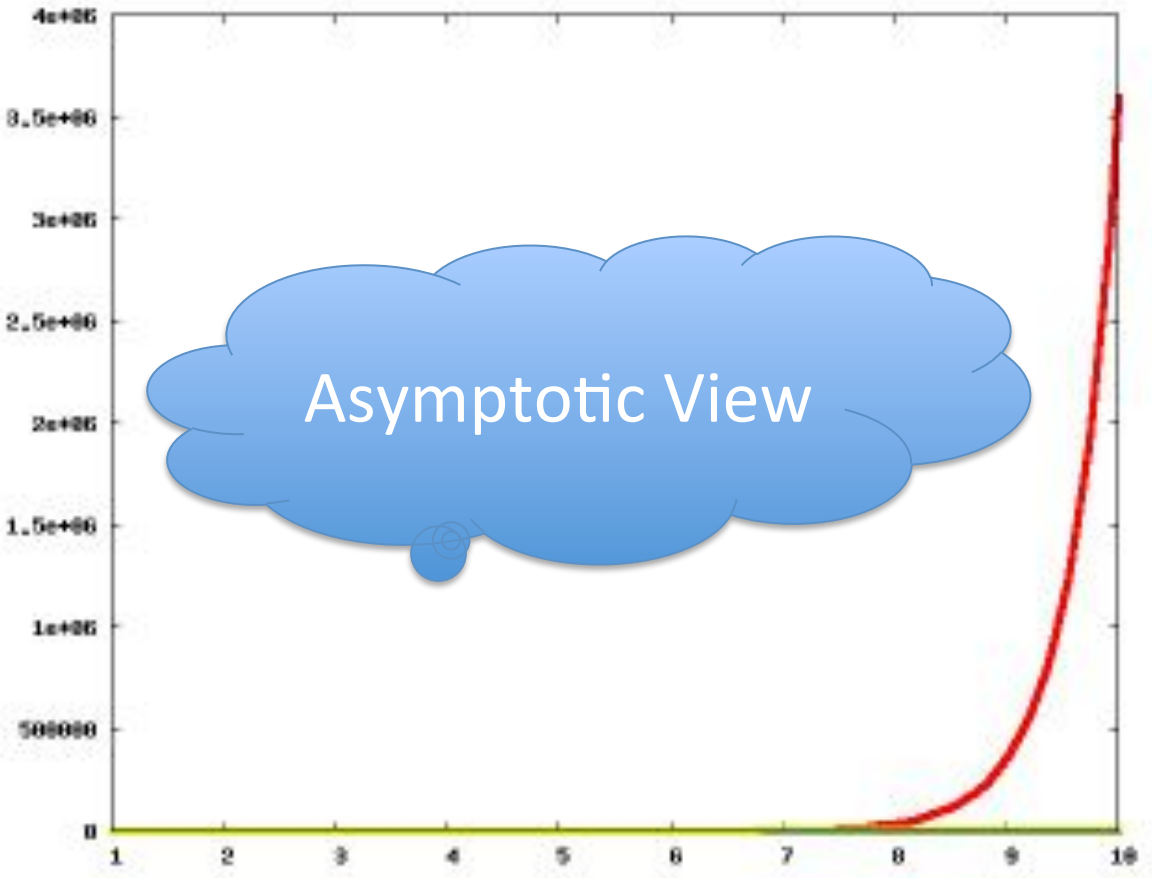


The actual run times

n!

$100n^2$

n^2



Asymptotic Notation

≤ is O with glasses

≥ is Ω with glasses

= is Θ with glasses