Cpt S 350 Homework #1

Please print your name!

No late homework!

1. In cpts317, we learned that a problem is a language. Such a statement builds a link from 317 to 350. For instance, consider the following problem:
Given: a graph G,
Question: is G connected?
This problem corresponds to the language that puts all the string encodings of the positive instances of the problem into: $\{\langle G\rangle : G \text{ is a connected graph}\}$, where $\langle G\rangle$ is a string encoding of graph G.

Please indicate the laguages corresponding to the following four problems:
Given: a number n and two primes p, q,
Question: is it the case that $n = p \cdot q$?

Given: a number n,
Question: is it the case that $n = p \cdot q$ for some primes p and q?

Given: an NFA A and a word w
Question: Does A accept w ?

Given: an NFA A
Question: Is there any word w such that A accepts w ?

2. Argue why the following is true:
(1). Function $2n^3 - 18n$ is $O(n^3)$ and also it is $O(n^4)$ but it is not $O(n^2 \log n)$.
(2). Function $3n^2 2^{2n}$ is $2^{O(n)}$.

3. In algorithm design, the most difficult part is probably to identify precisely the problem to solve. For instance, I have two maps or two molecular structures that I want to decide whether they are "similar". Clearly, the key here is first to define the similarity measure (I don't have an answer) between two graphs. Please describe your ideas in defining the measure (there is no wrong answers here).