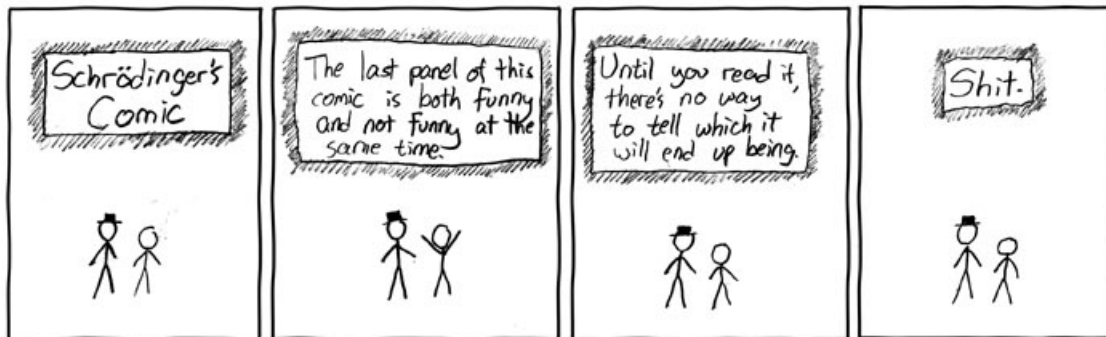# CS302 - Assignment 21
Due: Thurday, May 9 at the beginning of class
Hand-in method: paper

http://xkcd.com/45/

For the problems below you may use any of the problems discussed in class or in the book as known NP-Complete problems.

1. [**6 points**] ZERO-SUM is the following problem: Given a set of integers S is there a subset that sum to 0?

   Prove that ZERO-SUM is **NP-Hard**, i.e. you do not need to show that it is in NP, so you just need to provide a reduction function and show that it is correct.

2. [**12 points**] DOUBLE-SAT is the following problem: Given a boolean formula of n boolean variables $x_1, x_2, ..., x_n$ joined by m boolean connectives (one of: $\wedge$ (AND), $\vee$ (OR) and $\neg$ (NOT)), are there **two** different assignments of the variables such that the boolean formula evaluates to 1 (i.e. true)? For example, $(x_1 \vee \neg x_1 \vee \neg x_2) \wedge (x_2 \vee x_3) \wedge (\neg x_3)$ has two valid assignments, $x_1 = 1, x_2 = 1, x_3 = 0$ and $x_1 = 0, x_2 = 1, x_3 = 0$

   Prove that DOUBLE-SAT is NP-Complete.

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