Homework 2

1. Einstein's puzzle:

   There are five houses of different colors next to each other on the same road. In each house lives a man of a different nationality. Every man has his favorite drink, his favorite brand of cigarettes, and keeps pets of a particular kind.

   (a) The Englishman lives in the red house.
   (b) The Swede keeps dogs.
   (c) The Dane drinks tea.
   (d) The green house is just to the left of the white one.
   (e) The owner of the green house drinks coffee.
   (f) The Pall Mall smoker keeps birds.
   (g) The owner of the yellow house smokes Dunhills.
   (h) The man in the center house drinks milk.
   (i) The Norwegian lives in the first house.
   (j) The Blend smoker has a neighbor who keeps cats.
   (k) The man who smokes Blue Masters drinks bier.
   (l) The man who keeps horses lives next to the Dunhill smoker.
   (m) The German smokes Prince.
   (n) The Norwegian lives next to the blue house.
   (o) The Blend smoker has a neighbor who drinks water.

   The question to be answered is: Who keeps fish?

2. Write a predicate swap_first_2/2 (i.e. binary) that accepts a list and generates from it a similar list with the first two elements swapped.

3. Write a unary predicate on lists which succeeds for lists with three elements.

4. Write Prolog predicates to implement the following functions on integers:

   (a) $f(x) = x^2 + 5$,
   (b) $g(x) = 94 - 3x$,
   (c) $h(x, y) = 5xy^3 + 8x^4y^2$.

5. Here are some statistics about Romania:

   `http://www.euromonitor.com/FactFile.aspx?country=RO`.

   Among these, consider the first table (Demographic and economic indicators).

   Write Prolog predicates:

   (a) to show the growth/contraction of the GDP from one year to another (give the years as arguments, e.g. you should be able to answer what was the evolution of the GDP from 2006 to 2009),

(b) to compute the GDP per person per year (e.g. what was the GDP per person in 2008?),

(c) to compute the GDP per surface unit per year (e.g. what was the GDP per square kilometer).

Note: some quick experiments with arithmetic in Prolog will lead to the realisation that Prolog accomodates floating point numbers:

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?- X is 5/3.
    X = 1.66667.
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Don't be afraid to use them.