GAGP Tutorial 3 (week 6) on Schemas/ta

1. (Mitchell) When is the union of two schemas also a schema? When is the intersection of two schemas also a schema? E.g. the union of 1* and 0* is **; the union of 10 and 01 is not a schema.

2. (Goldberg) A population contains the following strings and fitness values in population 0 (but in practice populations are not this small, strings are not this short):

10001	20
11100	10
00011	5
01110	15

What is the expected number of instances of 1**** in the intermediate population? What about for 0**1*?

3. A population consists of the following strings. The probability of crossover is 0.75 and the probability of mutation is 0.1. How many instances of the schema *0***0 would you expect in the next population? [From 2005 exam paper.]

String	Fitness
100100	20
001000	20
110111	30
100101	20
100010	10

4. Investigate whether binary tournament selection (i.e. tournament size 2) is equivalent to linear ranking selection (i.e. selection in which the fittest of N gets N chances, the next-fittest gets (N-1) chances, etc., and the least fit gets 1 chance).

5. If f(****) = e0
    f(***1) = e0 + e1
    f(**1*) = e0 + e2
    f(**11) = e0 + e1 + e2 + e3

(these DEFINE e0...e3), then what is f(**01) in terms of e0...e3?

6. (Mitchell) Prove that any string of length l is an instance of 2^l different schemas.