**Functional Requirements:**

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| **Req No.** | **Description** | **Comments** |
|  | Create a genetic program for target function (x\*x-1)/2 with fitness measure zero | 1. Target function should be configurable to allow for change in requirement 2. Program needs to generate a fitness measure = 0 or as close to 0 as possible within 15 minutes |
|  | Randomly initialize the first generation to be evaluated | 1. Population size needs to be configurable 2. Population size should be large enough to have diversity but small enough to generate meaningful results in 15 minutes execution time ( Generally 51-100) 3. Training data set – negative and positive decimal numbers |
|  | Create successive generation(s) based on:  Fitness  Crossover  Mutation | Details in next three requirements |
|  | Fitness: Probabilistically determine the fittest individuals from the initial population of that generation | 1. Probabilistically select (1-r)p individuals 2. The criterion for defining “fitness” can change, but not likely. Configurability or the ability to quickly change code would be good. |
|  | Crossover: For each pair of fittest individuals, generate a pair of offspring using the Crossover operator | 1. What is the Crossover operator? Substituting portions of the individual binary trees with portions of binary trees representing (x\*x-1)/2? 2. The criterion for crossover can change (but not likely). Configurability or ability to quickly change code would be good. |
|  | Mutation: Invert a randomly selected bit in random members from population generated after Crossover | 1. Invert a randomly selected bit in m.p random members of new generation generated so far 2. The criterion for mutation can change, but not likely. Configurability or ability to easily change code would be good. |
|  | Use Binary Trees as individuals where –  Operators: +, -, \*, /  Operands: Digits 1-9 | 1. Tree depth needs to be configurable 2. Define behavior for division by zero (Is zero an eperand?) 3. User specified system requirement that can change, so configurability would be good |
|  | Execution time = 15 minutes | 1. User specified performance requirement 2. Should be configurable to allow for change by user |
|  | Termination criterion – Solution found matching Target function or Execution time is over |  |

*Note: Phetsy and Greg also included some nice system requirements that I have not included in here yet to keep meeting focused on user requirements. I will add a separate section for System Requirements in this document later.*