ASSIGNMENT 3:
Assigned: 10/22/17 Due: Sunday 10/29/17 at 11:55 PM Submit on moodle (in a zip if you have multiple files)

Written/drawn:

Problem 1. (10 points)
Find all pure Nash equilibrium and Pareto optimum in this game. Show work for your reasoning.

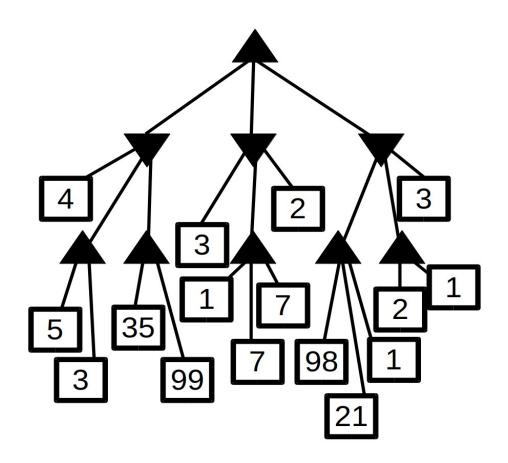|	P2 Acton 1	P2 Action 2
P1 Action 1	P1 = 2, P2 = 0	P1 = 2, P2 = 7
P1 Action 2	P1 = 3, P2 = 1	P1 = 4, P2 = 0

Problem 2. (20 points)
Use the same game from Problem 1, except find the mixed Nash equilibrium. Show work.

Then present an argument about whether P1 should use the mixed Nash equilibrium or the pure Nash equilibrium. Present a similar argument for P2. What is the overall conclusion?

Problem 3. (15 points)
What can you prune on the tree below using alpha-beta pruning? Show work.

Problem 4. (20 points)
Assume you and an opponent are playing the following Prisoner's dilemma game:

	P2 confess	P2 lie
P1 confess	P1 = -8, P2 = -8	P1 = 0, P2 = -10
P1 lie	P1 = -10, P2 = 0	P1 = -1, P2 = -1

You are going to play this game for 3 rounds with/against a tit-for-tat agent. Draw out a search tree for this problem and figure out the optimal solution. The reward after 3 games is the sum of the reward for each individual game that you played.

Then answer: are there any branches of this tree that you could have pruned?

Problem 5. (20 points)
Suppose your younger sibling is doing a minor is CSci and wants to take: 1133, 1933, 2011, 4011, 4041. Your sibling bugs you to make a schedule that follows these rules:
(1) Can complete all courses in three semesters
(2) No more than 2 CSci classes per semesters
(3) 1133 must be taken before 1933
(4) 2011 and 1933 must be taken before 4041
(5) 2011 must be taken before 4011

Write down the domains/possible values for each CSci course that are 1-consistent.

Next write down the domains for each CSci course that are 2-consistent. Show your work.

Is it possible for your sibling to fail a course and need to retake it while still following all these rules? If so, which one. If not, explain why not.

Programming (python):
This time we will be using the following algorithms for constraint satisfaction:
/root/csp.py

Problem 5. (15 points)
The "Zebra" problem is a classic constraint satisfaction problem defined as a set of 5: houses, people (of nationality), pets, cigars, drinks and colors. House 1 is on the far left with house 5 on the far right (house 3 is in the middle). Each house (numbered) has a single person (nationality), pet, cigar, drink and color associated with the house. No two houses share the same of any property (for example, each house has its own unique pet). The rules are:

- There are five houses.
- The Englishman lives in the red house.
- The Spaniard owns the dog.
- Coffee is drunk in the green house.
- The Ukrainian drinks tea.
- The green house is immediately to the right of the ivory house.
- The Old Gold smoker owns snails.

- Kools are smoked in the yellow house.
- Milk is drunk in the middle house.
- The Norwegian lives in the first house.
- The man who smokes Chesterfields lives in the house next to the man with the fox.
- Kools are smoked in the house next to the house where the horse is kept.
- The Lucky Strike smoker drinks orange juice.
- The Japanese smokes Parliaments.
- The Norwegian lives next to the blue house.

The question is then: Who owns the Zebra? And who drinks water?

(5/15 points) This classic problem is what is already put in as the Zebra problem. Run the backtracking_search() on this problem and report the answer to the two questions above. (It is fine to use the default parameters for backtracking_search().)

(10/15 points) Modify the problem to match the Zebra problem below (with names, sports, transportation and lawns) and report: Who has flowers in their yard? Who likes to watch Starcraft2?

- There are five houses.
- Albert likes baseball.
- Dietfried has a lawn with cleanly cut grass.
- Virgilijus enjoys watching rugby.
- Gallchobhar gets to work by walking.
- Bricius lives next to Virgilijus.
- The owner of the house with an Astroturf lawn likes baseball.
- The house with flowers in the lawn is between the house with trees and the house with rocks in the lawns.
- The person who likes baseball goes to work on a motorcycle.
- The 2nd house owners like to watch debates.
- The owner of the 4th house goes to work on a bicycle.
- The person who likes soccer takes a bus to work.
- The house with trees on the lawn to the right of the house with an owner who drives a car to work.
- Gallchobhar lives to the right of the person who likes Rugby.