PS 1514: Exam 1

Name:

Show all your work. No proof, no points.

1 Dominance Problem (2 Points)

Use strict dominance and iterated elimination of strictly dominated strategies to find the solution to the following game, if such a solution exists:

	Left	LC	RC	Right
Up	$1, 7$	$-1, 6$	$5, 3$	$0, 5$
UM	$0, 3$	$-2, 5$	$6, 4$	$-4, 0$
DM	$0.5, 8$	$-2, 9$	$5, -7$	$-5, 0$
Down	$2, 3$	$-4, 2$	$-1, 1$	$3, 5$

2 Best Response Game (2 points)

Find all pure strategy Nash equilibria of the following game by marking best responses:

	Left	LC	RC	Right
Up	$0, -7$	$0, 1$	$6, -3$	$0, 0$
UM	$-10, 3$	$4, 2$	$6, 4$	$-4, 7$
DM	$2.5, 3$	$-3, 0$	$1, -1$	$-2, 2$
Down	$4, 5$	$0, 0$	$-3, 2.5$	$2, 1$

3 Mixed Strategy Problem (4 points)

Find the mixed strategy Nash equilibrium of the following game.

	Left	Center	Right
Up	$-3, 3$	$5, -4$	$7, -5$
Middle	$1, -3$	$-2, 2$	$0, 1$
Down	$0, 5$	$-4, -4$	$0, -6$

4 Preventive War and Hidden (but Costly) Weapons Construction (4 Points)

States must worry that their rivals are secretly building weapons capable of great destruction. One possible solution is to declare *preventive war*, militarily defeat the other side, and ensure that such weapons (if they exist) will never be a problem. Both sides' strategies have significant drawbacks, though: war is costly to both states while building weapons is expensive to the rival.

With that in mind, consider the following interaction. State 1 must decide whether to *prevent* or *pass*. Simultaneously, state 2 must decide whether to *build* or *not build*. If state 1 passes and state 2 does not build, state 1 receives .8 and state .2 receives .2. However, if state 1 passes and state 2 builds, power shifts in state 2's favor. As such, state 1 receives .3 and state 2 receives .1. (The remaining .6 is lost to the weapons construction.) If state 1 prevents and state 2 does not build, state 1 receives .6 and state 2 receives .2. (The remaining .2 is lost in the costs of war.) Finally, if state 1 prevents and state 2 builds, state 1 receives .6 and state 2 receives -.4. (This time, .8 is lost through the costs of war plus the cost of weapons construction.)

a) Use the above information to construct and appropriately label a game matrix.

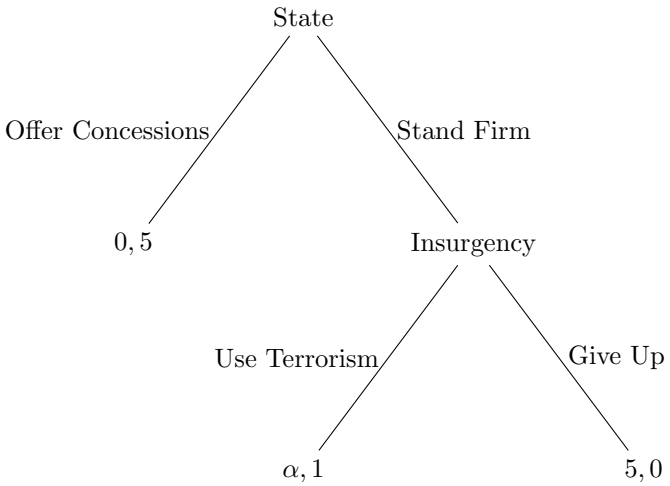
b) Use iterated elimination of strictly dominated strategies to find the solution to the game.

c) Note that state 1's worst outcome is to pass while state 2 builds. Why can state 1 trust state 2 in this case?

5 Terrorism and Selection (4 Points)

Consider the following interaction between a state and an insurgent group. The state must decide whether to offer concessions to the insurgency or stand firm. The insurgency would most like to receive concessions, but these are costly for the state to give. If the state stands firm, the insurgency must decide whether to use terrorism to achieve its goals or give up. Terrorism may or may not ultimately be effective, but it will be costly to the state regardless.

Let α represent the government's tolerance for terror. Imagine that the preferences are as follows:



a) Suppose $\alpha = -1$. Find the subgame perfect equilibrium.

b) Now suppose $\alpha = 1$. Find the subgame perfect equilibrium of the new version of the game.

c) Note that the only difference between part (a) and part (b) is that the state finds terrorism slightly more tolerable in the second case. What do these models say about our ability to understand whether terrorism is effective at coercing concessions if we only look at instances where terrorism occurred?

6 Terrorists at an Airport (4 points)

Consider an interaction between a terrorist and airport screeners. The terrorist can attempt an attack using his computer as a bomb or with liquid explosives. The screener only has time to search for one kind of contraband. If she guesses correctly, she will thwart the attack, and the terrorist will suffer a cost $c > 0$. If she is unsuccessful, the terrorist will gain a value $V_C > 0$ or $V_L > 0$ and the screener will lose that value, which depends on the vector of attack.

		Computer	Liquid
Terrorist	Computer	$-c, 0$	$V_C, -V_C$
	Liquid	$V_L, -V_L$	$-c, 0$

a) Find the game's Nash equilibrium.

b) How does the terrorist's probability of choosing computer increase as V_C increases?