Problem Set 2 Answers

1.) The payouts would be:

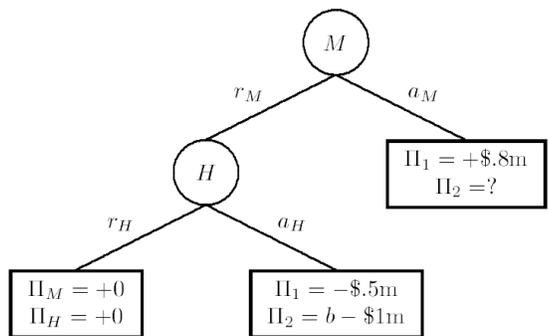|	R	P	S
R	0, 0	-1, 1	1, -1
P	1, -1	0, 0,	-1, 1
S	-1, 1	1, -1	0, 0

There is no Nash equilibrium, no point where neither player can unilaterally improve.

For the modified game:

	R	P	S
R	0, 0	1, -1	1, -1
P	-1, 1	0, 0,	-1, 1
S	-1, 1	1, -1	0, 0

In this game, neither player ever plays paper. The only Nash equilibrium is for both players to play rock, (R, R), as neither player can unilaterally improve at this point.

2.) a.) No, each player will have a best response that is dependent on what the other player does.

b.) Player 2 will never find it best to play "right," therefore it is dominated. With that strategy removed player 1 will never play "middle."

c.)Once we have eliminated the two dominated strategy there are few options remaining. The only Nash equilibrium is if (D, M) where player 1 plays down, 2 plays middle. Neither can improve unilateraly at this strategy.

```
                          ┌───┐
                          │ M │
                          └───┘
                   r_M    /     \    a_M
                        /         \
                   ┌───┐         ┌──────────────┐
                   │ H │         │ II_1 = +$.8m │
                   └───┘         │ II_2 =?      │
              r_H  /    \  a_H   └──────────────┘
                 /        \
        ┌─────────────┐  ┌──────────────┐
        │ II_M = +0   │  │ II_1 = -$.5m │
        │ II_H = +0   │  │ II_2 = b-$1m │
        └─────────────┘  └──────────────┘
```

Solution:

As can be seen from Figure , if $b > \$1,000,000$ then Hershey's equilibrium strategy is to accept the offer; likewise, Mars' equilibrium strategy is to accept the offer. If $b < \$1,000,000$, however, then the equilibrium strategies is for both firms to turn down the offer.

This differs from what actually happened (Mars rejected the offer, whereas Hershey accepted it). One possible explanation is that Mars underestimated either its own benefits from having M&Ms featured in the movie, or Hershey's benefits, or both.

Figure 1: Problem 3

		Japan			
		Low		High	
			3		4
U.S.	Low	4		2	
			2		1
	High	3		1	

Solution: By eliminating the option of turning back, Hernan Cortez established a credible commitment regarding his future actions, that is, to fight the Mexican natives should they attack. Had Cortez not made this move, natives could have found it better to attack, knowing that instead of bearing losses the Spaniards would prefer to withdraw.

Figure 2: Problem 4

Solution: (a) For the United States investing, a low value in HDTV research is a dominant strategy. The Nash equilibrium of the game is given by the U.S. choosing Low and Japan choosing High. The rationality assumptions implicit in this solution are that both players are rational and, moreover, Japan belives the U.S. acts rationally.

(b) See Figure   By solving backwards, with get the following Nash equilibrium: U.S. chooses High, Japan chooses Low.

(c) Comparing the answers from a. and b. we can see that the value of commitment to the U.S. is 1 that is, 3 minus 2.

Figure 3: Problem 5