UNIVERSITY OF WISCONSIN
Economics 101 – Spring 2007
Professor Brown
Problem Set 11

Due by April 25-27, 2007

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1. Solve for the Nash equilibria of the following games:

a. Coordination

		Bill	
		Windows	Linux
Linus	Windows	5, 7	1, -2
	Linux	2, 3	4, 4

b.”Chicken”

		Driver 2	
		Straight	Swerve
Driver 1	Straight	-1, -1	2, 1
	Swerve	1, 2	0, 0

2. In a small Nevada town, there are only two restaurants, the Road Kill Café and, for Italian fare, Sal Monella’s. Each restaurant has to decide whether to clean up its act or to continue to ignore health code violations.

Each restaurant currently makes $7000 per year in profit. If they both tidy up a bit, they will attract more patrons, but must bear the substantial cost of the cleanup; so they will both be left with a profit of only $5000. However, if one cleans up and the other doesn’t, the influx of diners to the cleaner joint will more than cover the costs of the scrubbing; the more hygienic place ends up with $12,000 and the grubbier place incurs a net loss of $3000.

a. Write the payoff matrix for this game.
b. Explain why this is a prisoner’s dilemma.
c. What is the Nash Equilibrium?

3. A newspaper runs the following contest:

Each contestant chooses and submits an integer between 0 and 1000 inclusive. The *winning integer* is defined to be that number which is 90% of the highest number that was submitted, rounding downward if the result is not an integer (that is, 9.8 would get rounded down to 9). For instance, if the highest number submitted were 500, the *winning integer* would be 450. All contestants who guess the *winning integer* split a $250,000 prize. Many people will enter the contest.

What is the Nash equilibrium of this game? Would you play this were you participating in the contest?

4. The following example is due to the British biologist John Maynard Smith.

Males of a certain species frequently come into conflict with other males over the opportunity to mate with females. If a male runs into a situation of conflict, he has two strategies. A male can play "Hawk", in which case he will fight the other male until he hurts him and wins. He can also play "Dove", in which case he makes a display of bravery but retreats of the other starts to fight. If a male plays Hawk and meets another male who plays Hawk, they are both seriously injured and neither gets the mate. If he is playing Hawk and meets an animal playing Dove, the Hawk gets to mate with the female and the Dove sinks off into celibate contemplation. If the two animals meet when both are playing Dove, the female gets bored and wanders off; both males find another mate, although they would have preferred to mate with the first female.

Draw a matrix that corresponds to the following game. The precise numbers are irrelevant, so long as they are correct in comparison to one another (i.e. appropriate payoffs are larger than other payoffs). Find the game's Nash equilibrium(a).

5. American Family Publishers regularly sends a mass mailing to millions of people inviting them to enter their sweepstakes, with prizes worth millions of dollars. The odds of winning depend on the number of entrants: the fewer entrants, the greater the probability that you will win.

Resolve the following riddle:

- How could anyone be so foolish as to waste time and stamps entering a competition where the odds of winning are so minuscule?
- If everyone is smart enough to figure this out, how could anyone be dumb enough not to enter?

6. Three ice cream vendors, Alice, Bob, and Carl, are planning to sell their frosty snacks on a beach that is one mile long. Each vendor wants to sell as much ice cream as possible.

All vendors charge the same price and sell exactly the same kind of ice cream (Babcock of course!).

The sand is quite hot, and hence beach-goers will buy ice cream from the closest vendor. Assume that the beach-goers are evenly distributed across the beach, and that they each buy only one ice cream cone.

Argue that it is *not* a Nash equilibrium for all three firms to locate at the center of the beach.