Philosophy 3334: Philosophy of Biology
Spring 2018
Second short assignment

Please print your essay and bring it to class on Tuesday, Feb 20th. **ALSO** please make your assignment anonymous by putting your R# at the top of the page and **NOT** your name.

1) Imagine the following scenario: A species of carnivore is such that there are two different hunting strategies in the population. Strategy 1 is to pursue the 'group hunt' strategy of attacking big game which is only successful with help. Strategy two is to pursue the 'lone wolf' strategy of hunting smaller game which is always successful. When the time comes to get food, the hunters find themselves nearby another hunter. If a 'group hunter' meets another 'group hunter' they each receive 4 units of benefit. 'Lone wolf' always receives 2 units of benefit no matter who they meet. But if a 'group hunter' meets a 'lone wolf', then 'group hunter' gets 0 benefit while 'lone wolf' gets 2.

In other words, we have the following payoff matrix:

	Group hunter	Lone wolf
Group hunter	4,4	0,2
Lone wolf	2,0	2,2

Which of these two strategies, if any, is an evolutionarily stable strategy? Explain how you know.

2) Imagine a two-player game where individuals in the population are paired at random. There are two possible strategies: heads and tails. If both players play heads or both players play tails, then nobody gets any payoff. However, if a head is paired against a tail, then the head receives 4 units of payoff and the tail receives 6. In other words, we have the following payoff matrix:

	Heads	Tails
Heads	0,0	4,6
Tails	6,4	0,0

In fact, neither heads nor tails is an evolutionarily stable strategy. Explain why not. Now imagine that the population is 80% heads and individuals are paired at random.

2a) What is the expected payoff of the heads strategy?
2b) What is the expected payoff of the tails strategy?

2c) Over time, this population will reach a stable state. What is the percentage of heads and tails in this stable state? Show your work and explain how you know this state is stable.

3) In each of these two followingscenarios, explain which trait will be favored by natural selection and why.

3a) Organisms of species Alpha typically find themselves in groups of size 5 on average. Organisms in this species leave their homes soon after they are born and so are no more likely to be nearby kin than nearby more unrelated organisms. When a predator attacks, there are two possible strategies: Strategy A is to simply run away. If you do so, the chance of being killed yourself is 5% and the chance of some other member of your group being killed is 80%. There is a 15% chance you will all get away. Strategy B is to send up an alarm call warning everyone in your group. The chance of being killed yourself is now 10% but there is only a 40% chance of someone else in your group being killed and a 50% chance that you will all get away. Will natural selection favor strategy A or strategy B?

3b) Organisms of species Beta live in family units consisting of a mother, father, and children. Sometimes there are 2 children, sometimes 3, sometimes 7, etc. On average, the group consists of 5 individuals. When a predator attacks, there are two possible strategies: Strategy A is to simply run away. If you do so, the chance of being killed yourself is 5% and the chance of some other member of your group being killed is 80%. There is a 15% chance you will all get away. Strategy B is to send up an alarm call warning everyone in your group. The chance of being killed yourself is now 10% but there is only a 40% chance of someone else in your group being killed and a 50% chance that you will all get away. Will natural selection favor strategy A or strategy B?

4) Males and females must have the same number of total offspring in any sexually reproducing population so if the population is split at 50% male, 50% female, they have the same number of expected offspring. But males typically have a much higher variance in the number of offspring they have (that is, they are more likely to have a lot more or a lot less than average). Explain why this is.