## Problem Set 10

- 1. The consumers in an economy own 1 unit of wealth each and are subject to risk. If a consumer is not careful, she may lose her wealth with probability p = 0.75. On the other hand, if a consumer is careful, this probability is 0.25. The utility function of the consumer is  $u = \sqrt{x} e$ , where x is wealth and e takes the value of 0.1 if the consumer chooses to be careful and 0 otherwise. In the economy, there is perfect competition among the insurance companies which, in addition are risk neutral.
  - a. Will a policy that insures the consumers completely generate a moral hazard problem?
  - b. If this is a competitive market, and given your answer in (a), what would be the price of a full insurance policy? Would the consumers buy it?
- 2. Jesualdo is a young kid who does not pay attention to his health. He likes eating ice cream, and gets a disutility of 10 if he eats no ice cream (and no disutility when he eats ice cream). His utility also depends on his pocket money in the following way  $u(w) = 2\sqrt{w}$ . In this beautiful world ice cream is free. But Jesualdo's mother, Ana, is very worried because she doesn't want him to eat too much ice cream. If he eats a lot of ice cream his probability of getting a major illness is 0.5, the probability of a minor illness is 0.25 and the probability of no illness at all is 0.25. On the other hand, if he eats no ice cream, the probabilities are 0.25 for a major illness, 0.25 for a minor illness at all. Ana's utility depends on Jesualdo's health. She gets a utility of 0 for a major illness, 100 in the case of a minor illness, and 1000 if there is no illness. Ana's utility also depends on the money she transfers to Jesualdo: a payment of w gives Ana a disutility of w.
  - a. What is Ana's expected utility if Jesualdo eats a lot of ice cream?
  - b. What is Jesualdo's attitude towards risk?
  - c. If Ana gives Jesualdo some pocket money that does not depend on his health, will he eat a lot of ice cream or none at all? Does your answer depend on the amount of pocket money why or why not?
  - d. Ana is considering a payment scheme in which she gives a bonus (B) to Jesualdo if no major illness is observed. Normalize the basic pocket money to zero. How much should B be in order to make Jesualdo eat no ice cream? Will she want to offer B?
- 3. The risk-neutral owner of a small coffee shop is hiring an employee to take care of business from 2pm to 8pm. There are three types of business days: days in which revenue is 3 (bad), 6 (medium), and days in which revenue is 12 (very good). The probability that a day is either bad or medium is  $\frac{1}{3} \frac{e}{6}$ , where e is the level of effort the employee exercises in order to keep customers satisfied. e can take two values:  $e_H = 1$  or  $e_L = 0$ . The utility of the employee is  $u_E(w, e) = (w 4)^{1/2} e$ , where w is the wage he receives on a daily basis. The utility of the owner is simply her net profit.
  - a. Determine the optimal incentive scheme under no moral hazard.
  - b. Determine the optimal incentive scheme under moral hazard.