1. John’s entire wealth consists of his house, located in Palo Alto. Scientists have just issued a prediction that there is a 20% probability that next year there will be a major earthquake in that area; as a consequence, insurance companies have announced that they will not offer earthquake insurance for the next 12 months. **John is risk averse.** He reckons that next year he will be able to sell his house for $980,000 if there is no earthquake and for only $120,000 if there is an earthquake (because the house will be condemned and require demolition).

**Jane is risk loving** and wants to buy a house in Palo Alto. Jane’s wealth consists of $1,200,000 in her bank account.

(a) Suppose Jane offers to buy John’s house for $P$.
   (a.1) Write the lottery that John faces if he decides to keep his house and thus rejects Jane’s offer.
   (a.2) Write the lottery that John faces if he accepts Jane’s offer.
   (a.3) Write the lottery that Jane faces if John rejects her offer.
   (a.4) Write the lottery that Jane faces if John accepts her offer.

(b) Find a price $P$ at which (1) John would be willing to sell his house today and (2) Jane would be willing to buy John’s house today. [There are many such prices: find one.]

2. Adam has an initial wealth of $500,000 and faces a loss of $300,000 with probability 1.5%. Adam is risk-averse.

(a) An insurance company offers Adam a full insurance contract with premium of $5,200.
   (a.1) Represent this contract as a pair $(W_1, W_2)$ where $W_1$ is Adam’s wealth in the bad state and $W_2$ is his wealth in the good state.
   (a.2) Will Adam accept this contract?
   (a.3) What is the insurance company’s expected profit from this contract is Adam accepts it?
   (a.4) What is the slope of the isoprofit line that goes through this contract in the $(W_1, W_2)$ space?

(b) Find a full-insurance contract that Adam would certainly accept.

(c) Now consider the following partial-insurance contract: premium of $4,000, deductible of $80,000.
   (c.1) Represent this contract as a pair $(W_1, W_2)$ where $W_1$ is Adam’s wealth in the bad state and $W_2$ is his wealth in the good state.
   (c.2) What is the insurance company’s expected profit from this contract if Adam accepts it?
   (c.3) What is the slope of the isoprofit line that goes through this contract in the $(W_1, W_2)$ space?

(d) Now consider a third contract with premium $5,000 and deductible $75,000.
   (d.1) What is the insurance company’s expected profit from this contract is Adam accepts it?
   (d.2) Write the equation of the isoprofit line that goes through this contract in the $(W_1, W_2)$ space (thus it should be written in the form $W_2 = f(W_1)$).