NAME:_____________________________ University ID:_____________________

• By writing your name on this exam you certify that you have not violated the University’s Code of Academic Contact (for example, you have not copied from the work of another student and you have not knowingly facilitated cheating by another student).

• If you submit the exam without writing your name and ID, you will get a score of 0 for this exam.

• If you do not stop writing when told so (at the end), a penalty of 10 points will be deducted from your score.
1. [20 points] Anton is risk neutral. His initial wealth is $4,000. Barbara is risk averse. Her initial wealth is $3,600 and she is facing the possibility of losing $1,200 with probability 25%.

(a) [10 points] Anton tells Barbara: “Let us sign a contract agreeing to the following: you give me now $x$ (for me to keep, no matter what happens) and then, if you suffer the loss, I will give you $y$ (note: I will still keep the $x$ you gave me, but I will give you $y$)”. Find values of $x$ and $y$ such that Barbara is better off if they sign the contract (relative to not signing the contract) and Anton is indifferent between signing the contract and not signing it. [Write your answer below.]

(b) [10 points] Suppose that Barbara’s utility-of-money function is $U(m) = \sqrt{m+100}$. Calculate the risk premium, for Barbara, associated with the lottery that she faces if she does not sign a contract with Anton.
2. [40 points] Sam’s entire wealth consists of his house, which is worth $220,000. The value of the building is $160,000 and the value of the land is $60,000. If a fire occurs, the building will be completely destroyed (but the land, of course, will still be there). The probability that a fire will occur within the next 12 months is 1%. An insurance company is offering the following contract for the next 12 months, call it contract $A$: a premium of $1,500 and a deductible of $20,000.

(a) [6 points] In a diagram where on the horizontal axis you measure wealth in the bad state (if there is a fire) and on the vertical axis wealth in the good state (if there is no fire), represent (1) the no insurance point ($NI$) and (2) contract $A$.

(b) [3 points] What is Sam’s expected wealth if he does not insure?

(c) [3 points] What is Sam’s expected wealth if he purchases contract $A$?

(d) [5 points] Calculate the insurance company’s expected profit from contract $A$. 
The question repeated for your convenience:
Sam’s entire wealth consists of his house, which is worth $220,000. The value of the building is $160,000 and the value of the land is $60,000. If a fire occurs, the building will be completely destroyed (but the land, of course, will still be there). The probability that a fire will occur within the next 12 months is 1%. An insurance company is offering the following contract for the next 12 months, call it contract A: a premium of $1,500 and a deductible of $20,000.

(e) [10 points] Sam does not have $1,500: he only has $800. He asks the insurance company what contract they could offer, call it contract B, that involved the same expected profit for the insurance company, but a premium of only $800. Calculate this contract and represent it in the diagram of part (a).

(f) [3 points] Calculate the slope of the isoprofit lines in the \((W_1, W_2)\) space.

(g) [8 points] Write the equation of the zero-profit line in the \((W_1, W_2)\) space (thus it should be written in the form \(W_2 = f(W_1)\)).

(h) [2 points] Suppose that Sam is risk-neutral. Will he buy contract B?
3. [40 points] In an online experiment 100 people (all of whom claimed that they preferred more money to less) were asked to rank lotteries $A$ and $B$ and also to rank lotteries $C$ and $D$, where

$$A = \begin{pmatrix} 4000 & 0 \\ 20 & 80 \\ 100 & 100 \end{pmatrix}, \quad B = \begin{pmatrix} 3000 & 0 \\ 25 & 75 \\ 100 & 100 \end{pmatrix}, \quad C = \begin{pmatrix} 4000 & 0 \\ 80 & 20 \\ 100 & 100 \end{pmatrix}, \quad D = \begin{pmatrix} 3000 \\ 1 \end{pmatrix}.$$ 

Their answers were as follows:

<table>
<thead>
<tr>
<th>ranking</th>
<th>$A &gt; B$ and $C &gt; D$</th>
<th>$A &gt; B$ and $D &gt; C$</th>
<th>$B &gt; A$ and $C &gt; D$</th>
<th>$B &gt; A$ and $D &gt; C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of people</td>
<td>20</td>
<td>44</td>
<td>5</td>
<td>31</td>
</tr>
</tbody>
</table>

(a) [15 points] How many people for sure did not satisfy the axioms of expected utility? Explain your answer in detail.
(b) [10 points] Some of these people correctly claimed to satisfy the axioms of expected utility and to be risk neutral. What were their answers? Explain your answer in detail.

(c) [15 points] If you satisfy the axioms of expected utility, your utility-of-money function is $U(m) = \ln(m)$ (where $\ln(m)$ denotes the natural logarithm of $m$) and your initial wealth is $21,000, how would you rank A and B and how would you rank C and D? Explain your answer in detail.