WINTER 2023 - SECOND MIDTERM EXAM  

NAME: _______________________________  University ID: ____________________  

CIRCLE THE NAME OF YOUR TA:  Joaquin Paleo  or  Robert Reaser  

If you don’t know the name of your TA, then circle your Section:  
A01, Tuesday 5-6  A02, Tuesday 6-7  A03, Thursday 5-6  A04, Thursday 6-7  

- 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. [10 points] Consider the following money lotteries:

\[ A = \left( \frac{1}{6}, \frac{1}{2}, \frac{1}{12}, \frac{1}{3} \right) \text{ and } B = \left( \frac{1}{6}, x, \frac{1}{10}, y, \frac{1}{12}, \frac{1}{3} \right) \]

Write two equations that need to be satisfied in order for every risk-averse person to prefer \( A \) to \( B \). [No need to solve the equations.]

2. [35 points] Consider the following figure, representing Ann’s von Neumann-Morgenstern utility-of-money function:

(a) [2 points] What is Ann’s attitude to risk?

For the following questions (b)-(e), let \( L \) be the money lottery \( L = \left( \frac{12}{p}, \frac{18}{1-p} \right) \) whose expected value is 14.

(b) [3 points] What is the value of \( p \)?
(c) Referring to the above diagram, assign one of the letters from the set \{A,B,C,D,E,F,G,H,K\} to each of the following (write the letter next to it) [note: repetitions are possible]:

(c.1) [2 points] $\mathbb{E}[U(L)]$ 
(c.2) [2 points] $U(\mathbb{E}[L])$ 
(c.3) [2 points] $U(18)$

(c.4) [2 points] $U(12)$
(c.5) [2 points] $pU(12) + (1-p)U(18)$

(d) One of the coordinates of one of the points from the set \{A,B,C,D,E,F,G,H,K\} represents the certainty equivalent of lottery $L$.

(d.1) [5 points] Which point?

(d.2) [3 points] Is it the vertical or horizontal coordinate?

(e) Denote a segment between two points $X$ and $Y$ by $\overline{XY}$ or $\overline{YX}$.

(e.1) [6 points] What segment represents the risk premium of lottery $L$?

(e.2) [6 points] What segment represents the difference between $U(\mathbb{E}[L])$ and $\mathbb{E}[U(L)]$?

3. [24 points] Consider all the binary lotteries of the form $\left(\begin{array}{c}
\frac{x}{5} \\
\frac{y}{5}
\end{array}\right)$ with $x \geq 0$ and $y \geq 0$. Let $A = \left(\begin{array}{c}
$100 \\
1 \\
\frac{1}{5}
\end{array}\right)$ and $B = \left(\begin{array}{c}
$60 \\
1 \\
\frac{1}{5}
\end{array}\right)$.

Write your answers on the next page.

(a) Andrea is risk neutral.
(a.1) [4 points] In the $(x,y)$ plane (where $x$ is measured on the horizontal axis) draw Andrea’s indifference curve that goes through point A.
(a.2) [5 points] Clearly show whether point B lies above, on, or below this indifference curve.
(a.3) [3 points] State in words what the shape of the indifference curve is (concave to the origin, convex to the origin or a straight line).
(b) Ben has the following von Neumann-Morgenstern utility-of-money function: $U(m) = \sqrt{m}$.

(b.1) [4 points] In the $(x,y)$ plane (where $x$ is measured on the horizontal axis) draw Ben’s indifference curve that goes through point A.

(b.2) [5 points] Clearly show whether point B lies above, on, or below this indifference curve.

(b.3) [3 points] State in words what the shape of the indifference curve is (concave to the origin, convex to the origin or a straight line).
4. [20 points] Consider the following money lotteries:

\[ A = \left( \begin{array}{cccc}
$15 & $20 & $35 & $45 \\
\frac{1}{5} & \frac{3}{5} & \frac{1}{10} & \frac{1}{10}
\end{array} \right) \text{ and } B = \left( \begin{array}{cccc}
$15 & $20 & $30 & $35 & $45 \\
\frac{1}{5} & \frac{3}{5} & \frac{1}{5} & \frac{1}{10} & \frac{1}{10}
\end{array} \right) \]

Recall that \( L >_{FSD} M \) means that lottery \( L \) dominates lottery \( M \) in the sense of first-order stochastic dominance and \( L \to_{MSP} M \) means that lottery \( M \) is a mean-preserving spread of lottery \( L \). Assume that the individuals considered prefer more money to less.

(a) [7 points] State whether \( A >_{FSD} B \) or \( B >_{FSD} A \) or neither. Show the work that justifies your answer.

(b) [3 points] Which of the two lotteries would a risk-neutral individual choose? Explain your answer.

(c) [3 points] Which of the two lotteries would a risk-loving individual choose? [Explain your answer. If you think that not enough information has been provided, state so.]

(d) [3 points] Which of the two lotteries would a risk-averse individual choose? [Explain your answer. If you think that not enough information has been provided, state so.]

(e) [4 points] State whether \( A \to_{MSP} B \) or \( B \to_{MSP} A \) or neither. Explain your answer.
5. [11 points] Consider the following von Neumann-Morgenstern utility-of-money function (for $x$ in the range $0 \leq x \leq 30$): \[ U(x) = 500 x - \frac{x^2}{2} - \frac{x^3}{6} \]

(a) [5 points] What kind of attitude to risk does this utility function display? Show the work that justifies your answer.

(b) [6 points] What is the Arrow-Pratt index of absolute risk-aversion when $x = 20$?