Problem 1 (Exercise 5.2). Consider an individual with von Neumann-Morgenstern utility-of-money function $U(m) = \ln(m)$ who faces lotteries of form

$$\begin{bmatrix} \$x & \$y \\ \frac{1}{3} & \frac{2}{3} \end{bmatrix}, \quad x \geq 0,\ y \geq 0.$$

(a) Calculate the expected utility of lottery $A = \begin{bmatrix} \$10 & \$40 \\ \frac{1}{3} & \frac{2}{3} \end{bmatrix}$.

(b) Calculate the expected utility of lottery $B = \begin{bmatrix} \$10 & \$10 \\ \frac{1}{3} & \frac{2}{3} \end{bmatrix}$.

(c) Calculate the slope of the indifference curve at point $A = (10, 40)$.

(d) Calculate the slope of the indifference curve at point $B = (10, 10)$.

(e) In the (x, y)-plane, draw the indifference curve that goes through point $A = (10, 40)$ and the indifference curve that goes through point $B = (10, 10)$.

Problem 2 (Exercise 5.6). Adam's current wealth is \$80,000. With probability $1/20$, he faces a loss of \$30,000. His vNM utility-of-money function is $U(m) = \ln(m)$.

(a) Calculate the slope of Adam's reservation indifference curve at the no-insurance point NI.

(b) Calculate the slope of the iso-profit curve that goes through point NI.

(c) Calculate the maximum premium that Adam is willing to pay for full insurance.

(d) Calculate the increase in Adam's utility relative to no insurance if he obtains full insurance at the "fair" premium (that is, at a premium that yields zero profits to the insurer).

(e) Consider contract $A = (80000 - h, 80000 - h)$. Calculate the slope at point A of Adam's indifference curve that goes through point A.

Problem 3 (Exercise 5.13). Your vNM utility-of-money function is $U(m) = \sqrt{m}$, your initial wealth is \$576, and you face a potential loss of \$176 with probability $1/7$. An insurance company offers you the following menu of choices: if you choose deductible $d \in [0, 176]$, then your premium is $h = (176 - d)/9$.

(a) Translate the equation $h = (176 - d)/9$ into an equation in terms of wealth levels.

(b) Compare the slope of the reservation indifference curve at the no-insurance point NI to the slope of the insurance budget line. Are there contracts that are better for you than no insurance?

(c) Which contract will you choose from the menu?