The following homework assignment is to be submitted via email to Leonard (Haoyu) Wang at hw00052@mix.wvu.edu with a "cc" to me. The answers are due before class time on the day after we begin the next block of material. They should be typed up and emailed to Leonard in Word. (This will take a bit of time, but it is good practice.)

(1) Frank Knight distinguishes between risk and uncertainty. In a short paragraph describe the difference between choice settings characterized by risk and ones characterized by uncertainty.

(2) Draw a diagram of a risk averse individual, Al, that confronts a risky situation, where a "bad" outcome occurs about 1/10 of the time and a normal or high outcome occurs the rest of the time. Label all important details, including such things as the expected value of the random event, the expected utility associated with it, the individuals risk premium, and the highest price that the individual would pay to avoid the risk entirely.

(3) Now suppose that Al instead faces an uncertain situation and is considering creating a rainy-day fund. Al has recollections of a series of nasty surprises that follow no regular pattern, with losses of $100, $2000, and $10,000. (a) Is there any sensible (rational) process that Al can use to determine the ideal size of this fund? (b) Discuss briefly why uncertain events are more difficult (possibly impossible) for insurance companies to insure and so self-insurance remains commons for such events.

(4) Suppose a local seller, Apex, realizes that by increasing the probability of high-quality units, that his demand and profits may be higher. He can do so by investing in R&D with the intent of increasing average quality. (a) Characterize his research activity, output level, and the price that he'll charge if the firm has a downward sloping demand curve. (b) Discuss briefly why the same model may be used to model decision making in Knightian circumstances if Apex's top management "think statistically" about their choices.

(5) In a short paragraph or two, characterize the Knightian, Schumpeterian and Kirznerian conceptions of Entrepreneurship—and explain why uncertainty must play a role in any profits that they manage to earn through their entrepreneurial activities.

(6) Suppose that Apex is an innovative company and sells its unique products to a clientele with a typical demand curve of $Q = q(P, X, Y)$ with P being the selling price of the good, X being special or unique features of the product, and Y being average consumer income. Suppose also that the number of customers that are attracted vary with P and X

as with N=n(P, X). The products are produced in more or less the usual way, with C=c(Q, w, r, R) where R is research and development that tends to add to the "X" factor, as with $\Delta^e = f(R) (X+\Delta) + (1-f(X)) (0)$. (a) Write down Apex's expected profit function and (b) write down the first two first order conditions that characterize its optimal output and investment in R and D. (c) Discuss briefly how successful innovation affects Apex's demand and profits.