The **Endterm** exam is comprehensive although it focuses mainly on material covered after the midterm. You can refer to the class notes, web notes, and to the optional text books, but not to the internet more generally, chatbots, math programs, or colleagues. Your work on the exam should be completely independent of that of your fellow students. Derivations for all the math should be included, not simply the final answers. Diagrams (if any) are best drawn using the drawing tools from Word or some other graphical program such as Coreldraw basics.

Your completed **Endterm** exam should be submitted via email to Prof Congleton at [roger.congleton@mail.wvu.edu](mailto:roger.congleton@mail.wvu.edu). Your answers are due before 2:00 pm on Monday November 27. Your exam should be typed and emailed to me in Word (or pdf). Your exam should have a title: *EC701-EX2\_lastname\_firstname*. Your enote should have a header—EC701 Final Exam. I will grade them over the next couple of days, and then return and review them in class on Thursday November 30.

Most of the following questions are a bit different from those worked on the homework problem sets, but most are very closely related. For the problems that depart from the homework problems, you’ll need to think a bit about how to use the ideas, mathematical methods, and results from the lectures and homework exercises to answer them. The answers require just a bit of insight and understanding from the lectures and exercises to answer.

All of your answers are to be your own independent work. Only the class notes and handouts can be consulted—no friends or web sources or chatbots are allowed.

1. Some Basic Ideas
2. (5 pts each) Briefly define the following economic terms with a few sentences and/or with equations when appropriate:
   1. Expected Value
   2. Present Discounted Value
   3. Knightian Uncertainty
   4. Social welfare function
   5. Veil of Ignorance
3. Problem Solving: Answer THREE of the Following Problems. (If you answer more than three, I’ll just grade the first three.)
4. (25 points) Suppose that Apex is an innovative company and sells its unique products to a clientele with an average demand curve of Q = q(P, X, Y) with P being the selling price of the good, X being a special or unique features of the product, and Y being average consumer income. Suppose that the number of customers that are attracted to Apex 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 Xe = f(R) (X+Δ) + (1-f(X)) (X+0), where f(r) is the probability of successful innovation.
5. Write down Apex’s expected profit function.
6. Write down the two first order conditions that characterize its optimal output and investment in R and D.
7. Discuss how successful innovation affects Apex’s demand, costs, and profits.
8. (25 points) Analyze the effects of health insurance on Al's choice of lifestyle. Assume that Al has only two states of health: healthy, H, and not healthy, S=s(I). The utility of being healthy is *U(R, H)* and the utility associated with being sick is U(R, s(I)) where *I* is the extent of Al's health insurance and *R* is some pleasurable activity that has a health risk associated with it. The probability that Al is unhealthy is *F=f(R)* where *R* is a risky activity like drinking eggnog or eating fruit cake. Let c be the cost of Al's health insurance and suppose that Al's initial budget constrain is *Y = R + cI*. Health insurance increases the quantity of health care that Al receives and thereby reduces the burden of being sick, but not to full health.)
9. Characterize Al’s expected utility in this choice setting.
10. Characterize Al’s optimal level of the risk-taking activity and insurance.
11. Now suppose that the amount of health care is freely available (e.g. c=0). Characterize the level of risk activity R would Al engage in this case. Briefly discuss Al’s behavior.
12. (25 points) Suppose that Al values health, H, transport services, T, and other personal consumption, C, so that U=u(H, T, C). Automobile size (S) and gasoline (G) are inputs into the household production of transport services, T = t(S, D), with T increasing as S and distance D increases. Gasoline consumption is a monotone increasing function of the automobile's size and the distance travelled, so G=g(S,D). Travel is a bit risky. The probability of an accident increases with the distance travelled, F = f(D), and the probability of not being in an accident is [1-f(D)]. The damage to health falls as automobile size increases, so Al's health after an accident can be modeled as H = Ho - d(S). When no accident occurs, Al's health is unaffected by driving, so H = H0. The individual of interest, Al, has W dollars to allocate between C, S, and G which are purchased in competitive markets. Personal consumption is thus C = W - P1S - P2G. (Note that in this case, G is determined by one’s choice of automobile size and distance driven, rather than chosen separately.)
13. Write down Al's expected utility function. (Hint: after substituting for the various definitions and relationships, there should be at most two control (choice) variables.)
14. Characterize Al’s expected utility maximizing car size and distance driven.
15. Using the implicit function theorem to write down Al’s demand function for D and S.
16. Briefly discuss the tradeoffs and/or marginal costs and benefits that Al’s choice takes account of.
17. (25 points) In the space below,
18. Draw a game matrix and make up your own numbers (or algebraic payoffs) to illustrates the dilemma of fraud. Clearly label the Nash equilibrium and discuss very briefly the nature of the problem. *(Do not use the numbers from the web or class notes.)*
19. Draw another game matrix using the same payoffs, where the problem may be solved by a virtue increment (V) associated the merchant’s ethical disposition to make honest offers. How large does V have to be to solve the problem?
20. Assume that V is too small to fully solve the problem of fraud, and that diligent and honest law enforcement is available that can substitute to some extent for your merchant’s weak ethics. What expected fine is sufficient to solve the problem if V is only half as large as required to solve the problem of fraud characterized by your game matrix? Write down the algebraic relationships necessary for V or F or a combination of the two that are sufficient to solve the problem. Discuss briefly how the required fine vary with the virtue increment of the merchant.