Midterm (ANSWER KEY)
ECNS 316 (Spring 2021)
Due to me via email (dwight.anderson@montana.edu) by noon on Friday, March 12th

_____Name

1.) Recall our analysis of optimal reckless driving enforcement. Consider James, a reckless driver who derives the following benefits from driving recklessly:

$$B(R)$$

where B is his concave benefit function (i.e., $B'(R) > 0$, $B''(R) < 0$) and R is his chosen level of reckless driving. Suppose the costs that James imposes on society can be expressed by the following convex cost function (i.e., $C'(R) > 0$, $C''(R) > 0$):

$$C(R).$$

Furthermore, suppose that enforcement costs of reckless driving are expressed as:

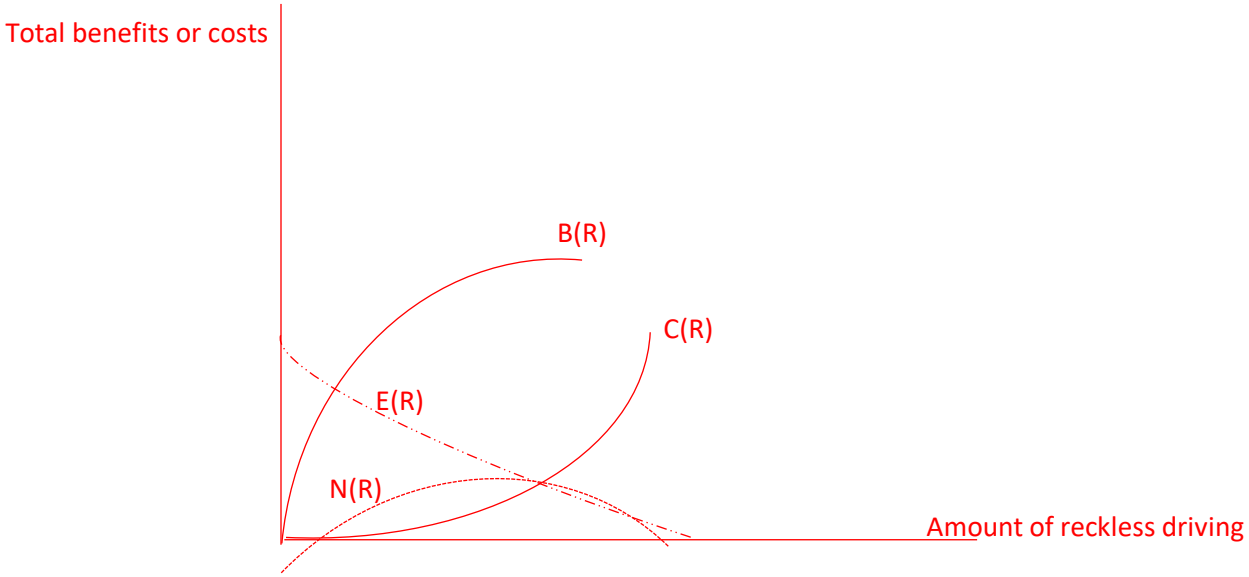
$$E(R)$$

and that these costs are strictly decreasing in R.

a.) (5 points) Show the algebraic expression for the net benefit of reckless driving, N(R), as a function of the terms defined above.

$N(R) = B(R) - C(R) - E(R)$

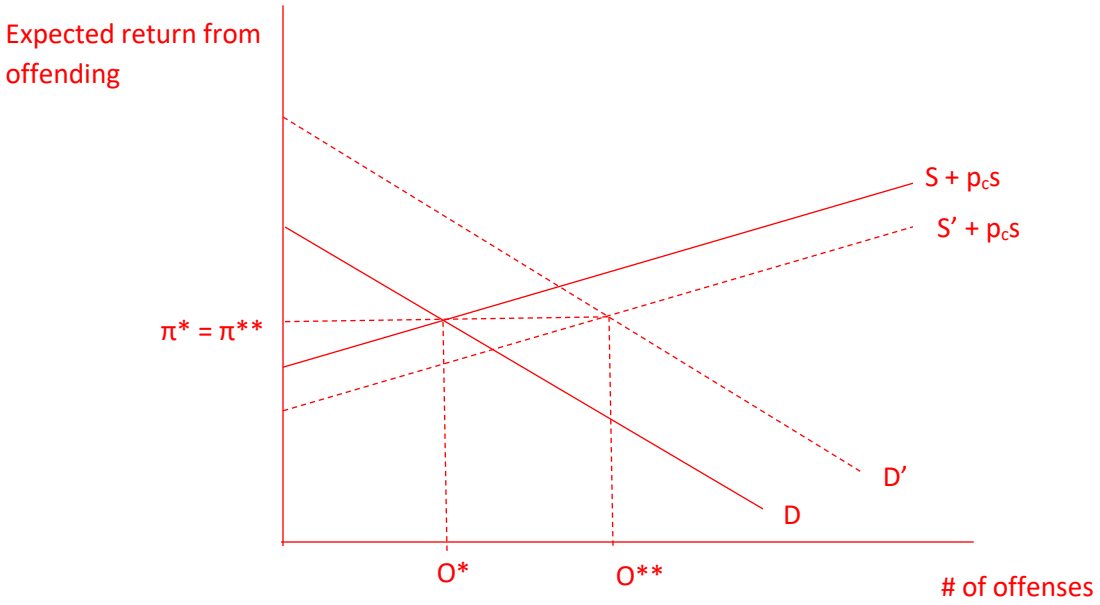
b.) (10 points) In the space below, illustrate graphically B(R), C(R), E(R), and N(R). Make sure to label your graph!



c.) (5 points) Is it possible to have a scenario where the largest net benefit to society of reckless driving, N(R*), is less than zero? Explain very briefly in the space below.

Yes, if the N(R) curve lies entirely below the horizontal axis, then the largest possible net benefit to society, N(R*), would be negative.

2.) (10 points) Consider a market for burglary. First, graph the demand for offending and the supply of offenses gross of sanctions curves. Second, suppose potential victims start exercising less caution; and, at the same time, there is an advance in the technology of offending. Illustrate what happens to the equilibrium level of offending and the equilibrium expected return from offending.



Supply and demand both shift outward. As a result, the equilibrium level of offending rises, while the effect on the expected return from offending is theoretically ambiguous.

3.) Indicate whether the below utility functions of income belong to risk neutral, risk seeking, or risk averse individuals (circle one). For full credit, you must show your work using calculus.

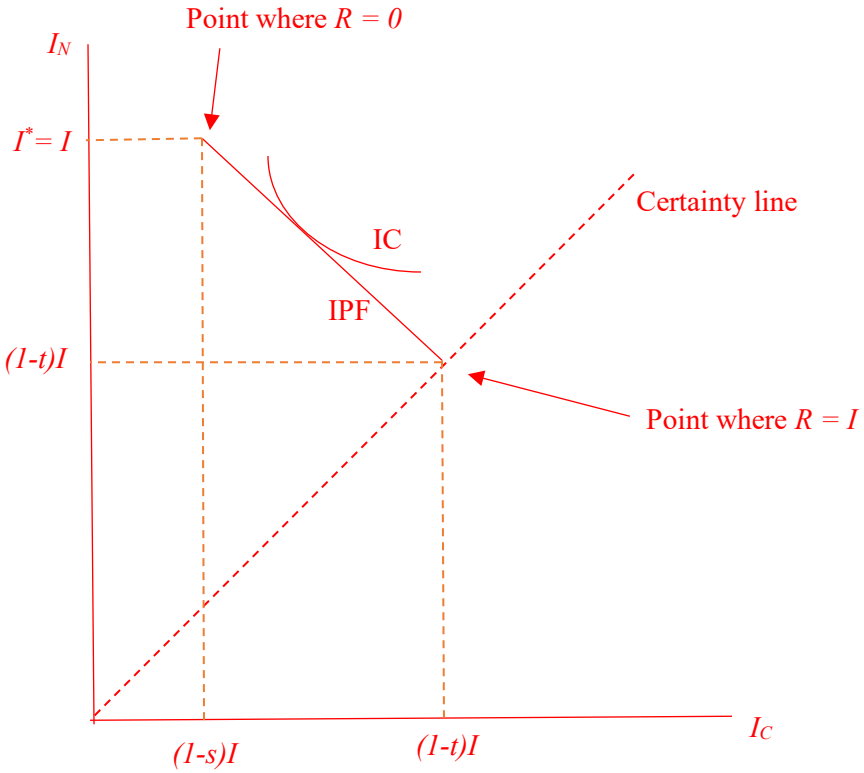
a.) (3 points) $U(I) = I^{\alpha}$ where $0 < \alpha < 1$. (i) risk neutral; (ii) risk seeking; (iii) risk averse
risk averse

b.) (3 points) $U(I) = 10I$. (i) risk neutral; (ii) risk seeking; (iii) risk averse
risk neutral

c.) (3 points) $U(I) = I + (.05)I^3$. (i) risk neutral; (ii) risk seeking; (iii) risk averse
risk seeking

d.) (3 points) $U(I) = 1 - \exp^{-aI}$, where $a > 0$. (i) risk neutral; (ii) risk seeking; (iii) risk averse
risk averse

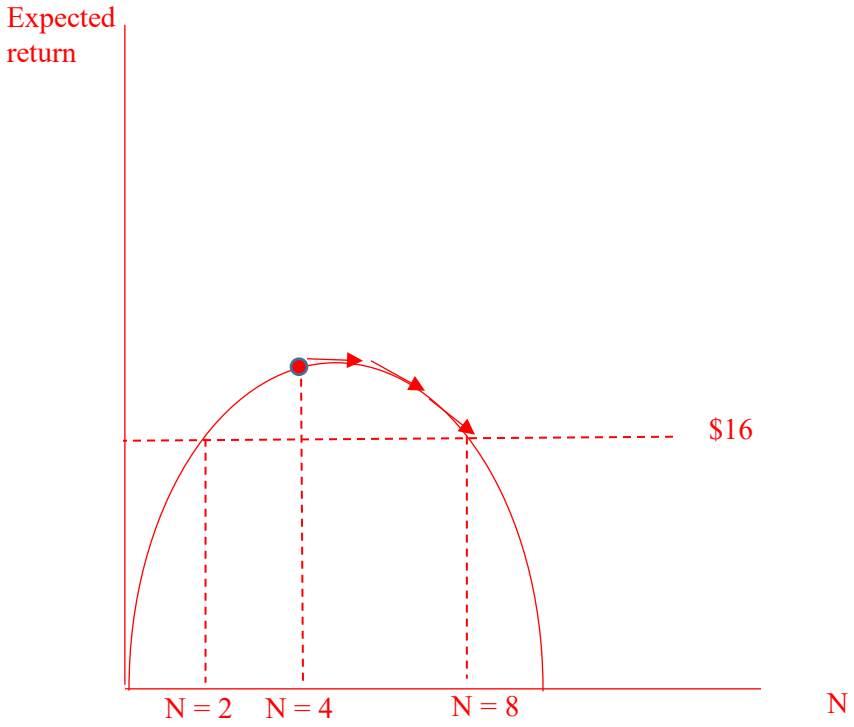
4.) a.) (10 points) Consider the tax evasion model we covered in class where p_c is the probability of conviction, s is the sanction (i.e., penalty tax rate), I is actual income, R is reported income, and t is the income tax rate. Illustrate graphically an internal solution for a risk averse tax payer. In your graph, make sure to show the income possibilities frontier (IPF), certainty line, and the vertical and horizontal axis values that correspond to the points on the IPF where R=0 and R=I.



b.) (5 points) For the risk averse taxpayer, is it theoretically possible for authorities to deter all evasion? If so, how would this be accomplished in the model above? If not, why not? (Note: You do not need to do any calculations or add to the graph above, the correct intuition will suffice.)

Yes, it is possible to have a corner solution at the point where R = I if the probability of conviction is sufficiently high.

5.) a.) (10 points) Assume that the current city-wide wage, net of sanctions, of drug dealers is $16 per hour. Consider a potential drug market in a neighborhood called Banana Kush Square. Assume that the wage, net of sanctions, earned by drug dealers in Banana Kush Square is given by $W = 10N - N^2$, where N is the number of dealers operating in Banana Kush Square at any time. Assume that there are currently N = 4 dealers in Banana Kush Square. What would you expect to happen to the number of dealers in this drug market over time? Support your answer with a graph…no graph, no points.



Assuming there are 4 drug dealers in the market, we would expect the market to grow over time, until the steady-state equilibrium of N = 8 dealers is reached.

b.) (3 points) Now, assume there are N = 9 dealers in Banana Kush Square. What would you expect to happen to the number of dealers in this drug market over time?

We would expect one of them to leave the market, thus reaching the steady-state equilibrium of N = 8.

6.) (10 points) There are two armies. One is strong and the other is weak. Each can play one of two strategies: "attack" or "don't attack". If the strong army plays "attack" it will always get a payoff of +G. If the strong army plays "don't attack", then it will get a payoff of –S when the weak army plays "attack". If the weak army plays "attack" when the strong army plays "attack" then it gets a payoff of –G. If the weak army plays "don't attack" when the strong army plays "attack" then it gets –S. If the weak army plays "attack" when the strong army plays "don't attack" then it gets a payoff of +S. If both armies play "don't attack" at the same time then each get zero. Assume that G > S > 0.

Write up the normal form representation of this game (i.e. the 2x2 box representing each army's strategies and the accompanying payoffs). Is there a Nash equilibrium? If so, what is it?

		WEAK ARMY	
		Attack	Don't attack
STRONG ARMY	Attack	G, -G	G, -S
	Don't attack	-S, S	0, 0

Nash equilibrium is for strong army to play "attack" and the weak army play "don't attack."

7.) Consider the following game where Player 1 chooses rows and Player 2 chooses columns. The value on the left in each cell represents the payoff to Player 1 and the value on the right represents the payoff to Player 2.

		Player 2			
		Strategy A	Strategy B	Strategy C	Strategy D
Player 1	Strategy A	15, 11	17, 10	19, 12	10, 11
	Strategy B	12, 20	21, 21	7, 18	9, 10
	Strategy C	6, 27	9, 15	18, 19	29, 9
	Strategy D	11, 14	8, 9	16, 17	18, 21

a.) (5 points) What is the cooperative equilibrium?
(B, B)

b.) (5 points) Solve for the Nash equilibrium(s).
There are 3 Nash equilibriums: (A, C) and (B, B)

8.) (10 points) Consider the required reading, "Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption" by Anderson et al. (2013) in the *Journal of Law and Economics*.

What does theory predict will happen to the equilibrium price and quantity of recreational marijuana when medical marijuana is legalized and there are sufficient spillovers to the illegal market? Support your answer with a simple supply and demand diagram. No diagram, no points.

Supply and demand both shift out. Thus, there is unambiguous increase in quantity, but effects on price are ambiguous.

9.) (10 points) Based on the theoretical argument in Cunningham and Shah (2018), how should the decriminalization of prostitution affect STI transmission? Based on their empirical analysis, what do they find? Please be brief in your answer. You should require no more than a short paragraph to answer this question.

In theory, the effect is ambiguous. Decriminalization should expand the sex market. An expansion could increase STI transmission because the size of the sexual network goes up. On the other hand, if expansion means that lower risk sex workers enter the network, then STI transmission may fall because the marginal sex worker has lower background risk or engages in safer behaviors.

These authors find that the incidence of female gonorrhoea falls by over 40%.