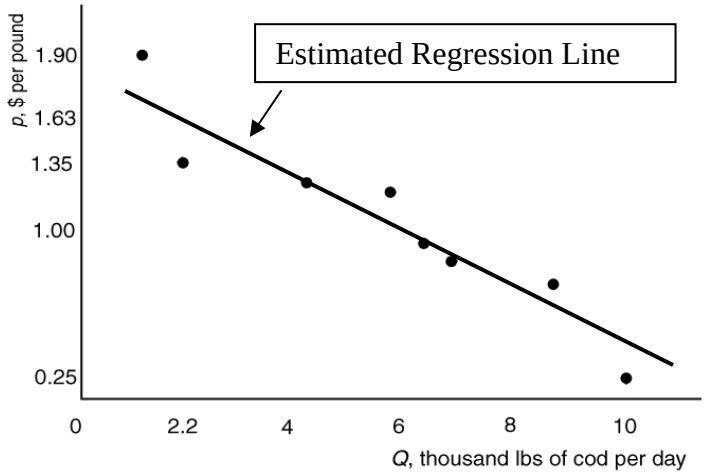
This Commerce/ FRE 295
FINAL EXAM MARKING GUIDE

There are 20 questions. Each question is worth 2 pts.

1. Plastic and steel are substitutes in the production of auto-body parts. If the price of plastic increases, with all other things remaining the same, we would expect

a) the price of steel to fall.
b) the demand curve for steel to shift out (to the right).
c) the demand curve for plastic to shift in (to the left).
d) the demand curve for steel to shift in (to the left).

2. Consider the following diagram showing an estimated demand curve for cod at the Portland Fish Exchange then select the correct response from the responses below.



a) Because some data points do not lie precisely on the regression line the estimated demand curve is not useful for managerial purposes.
b) The estimated demand curve is non-linear.
c) A regression line of this type can be obtained by using Excel to fit a trend line through the data points.
d) All of the above.

3. The demand schedule for avocados is such that quantity purchased is 30 when P = 10 and quantity purchased is 26 when P = 12.

a) This information implies that the demand schedule for avocados is linear.
b) This information can be used to calculate a point elasticity but not an arc elasticity of demand.
c) The arc price elasticity of demand is equal to -11/14.
d) If the demand curve for avocados shifts out due to an increase in consumer income, the point elasticity of demand for a given price cannot change but the arc elasticity may change.

4. Dennis always receives the same additional utility from two additional apples or one additional orange. Therefore his marginal rate of substitution of apples for oranges takes on a constant value of -2: he stays on the same indifference curve if he substitutes two apples for one orange. Dennis will consume all apples and no oranges if:

a) The prices of oranges and apples are the same.
b) The price of apples is less than half the price of oranges.
c) The price of oranges is less than twice the price of apples.
d) (b) and (c) are both correct.

5. A firm employs labor and capital in its production process. Isoquants have the usual convex shape and the firm is currently using both capital and labour. At the current level of production, the marginal product of labor is 3 and the marginal product of capital is 5. The competitive market equilibrium wage rate is $10 per hour and the rental rate of each unit of capital is $20 per hour. The firm

a) is producing its current output level at minimum cost.
b) could reduce the cost of producing its current output level by employing more capital and less labor.
c) could reduce the cost of producing its current output level by employing more labor and less capital.
d) could increase its output at no extra cost by employing more capital and less labor.

6. Consider a firm in which labor is the only input. If the marginal product of labor is constant,

a) the average product of labor is greater than its marginal product for all levels of labor input.
b) the average product of labor is equal to its marginal product for all levels of labor input.
c) the average product of labor is less than its marginal product for all levels of labor input.
d) None of the above.

7. Most large firms in Canada are corporations. Which of the following statements correctly indicates an important advantage of the corporate form of organization?

a) Corporations have unlimited liability for the debts they incur.
b) The corporate form eliminates potential agency problems arising from conflicts of interest between shareholders and senior executives.
c) The shares of corporations must be traded on public stock markets (like the Toronto Stock Exchange).
d) None of the above.

8. Fran's inverse monthly demand for gasoline is given by P = 10 – 0.1Q. Zoe's inverse demand curve is P = 8 – 0.2Q. Note that P is the price of gasoline per liter and Q is the number of liters purchased. Assume the gasoline market is perfectly competitive. The equilibrium price of gasoline is $ 1.20.

a) In equilibrium Zoe will consume more gasoline than Fran.
b) If Fran's demand changes to P = 8 – 0.1Q her consumption of gasoline will rise.
c) If Zoe's demand changes to P = 12 – 0.4Q her consumption will fall.
d) None of the above.

9. Which of the following events is not likely to result in a deadweight loss in a perfectly competitive market for rice in Indonesia?

a) **A flood that reduces the supply of rice by 50 percent**.
b) A government price control that raises the price by 20%.
c) A special tax on rice for high income people.
d) A requirement that farmers sell rice to schools at 50% of the market price.

10. In order for a firm to successfully carry out individual price discrimination, which of the following conditions must hold?

a) The firm must have some market power.
b) Buyers with differing demands must be distinguishable.
c) The firm must be able to prevent or restrict arbitrage (that is, resale of its products).
d) **All of the above**.

11. Which of the following is not helpful for the successful operation of a cartel?

a) The supply curve of non-cartel members is very price elastic.
b) The cartel supplies most of the world's output of the good.
c) The cartel enjoys economies of scale in production.
d) The demand for the good that the cartel sells is relatively price inelastic.

12. Firm A's best response function when firms A and B compete in a Cournot-Nash oligopoly can best be described as a schedule that shows

a) the price that maximizes profits for A for each price that might be set by B.
b) the quantity that maximizes revenue for A for each quantity that might be chosen by B.
c) the quantity that maximizes profits for A for each quantity that might be chosen by B.
d) the profits earned by A in a best response Nash equilibrium.

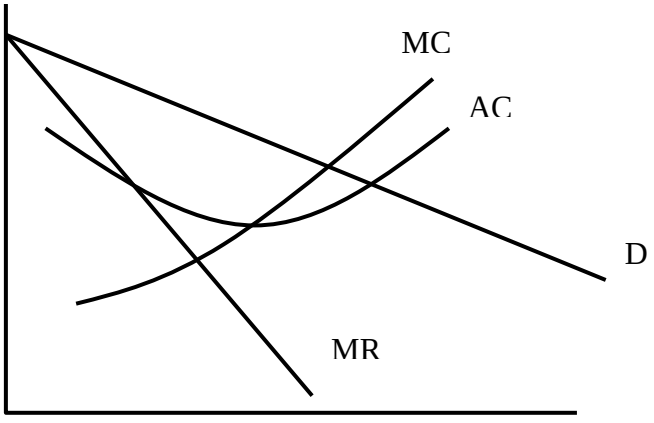
13. Suppose firm A behaves as a Stackelberg leader and firm B behaves as a Stackelberg follower when choosing quantity in a market for a homogeneous good (e.g., steel). Which statement is correct?

a) This oligopoly game involves sequential moves rather than simultaneous moves.
b) Consumers would face a higher price if firms A and B replaced their Stackelberg leader-follower relationship with a successful cartel.
c) Firm A makes use of firm B's best response function when choosing its profit maximizing quantity.
d) **All of the above**.

14. CycleMania (a U.S. online firm) and GoingCyco (a Canadian online firm) compete using Betrand pricing when supplying a specialized bicycle component to Canadian customers. Both firms have the same cost of for the product, but CycleMania uses UPS as a courier, which charges $20 per delivery, and GoingCyco uses Canada Post as a courier, which charges $10 per delivery. Assume zero fixed costs for both firms.

a) The equilibrium profit earned by CycleMania will increase if demand shifts out.
b) Each firm simultaneously chooses a profit maximizing level of sales, and equilibrium sales are then used to calculate the equilibrium price.
c) The equilibrium price of the bicycle component increases if Canada Post's delivery charge increases from $10 to $12.
d) None of the above.

15. The following diagram illustrates an industry characterized by monopolistic competition. All firms in the industry faces identical cost and demand conditions. The diagram shows the short run situation for a representative firm.



a) In the long run this industry would attract entry of new firms.
b) This firm has economies of scale at all output levels.
c) This firm would produce at the minimum of its average cost curve in long run equilibrium.
d) All of the above.

16. Consider the following game where firms A and B must choose whether to allocate capital to product promotion or to research and development (R&D).

Firm B

Firm A		Promotion	R&D
	Promotion	X,X	22,15
	R&D	5,40	20,30

a) A and B both have dominant strategies if X = 10.
b) If X = 10 and B uses a maximin strategy, then B will choose Promotion.
c) If X = 14 then the equilibrium outcome represents a prisoners' dilemma.
d) If X = 3 then the game has multiple Nash equilibria in pure strategies.

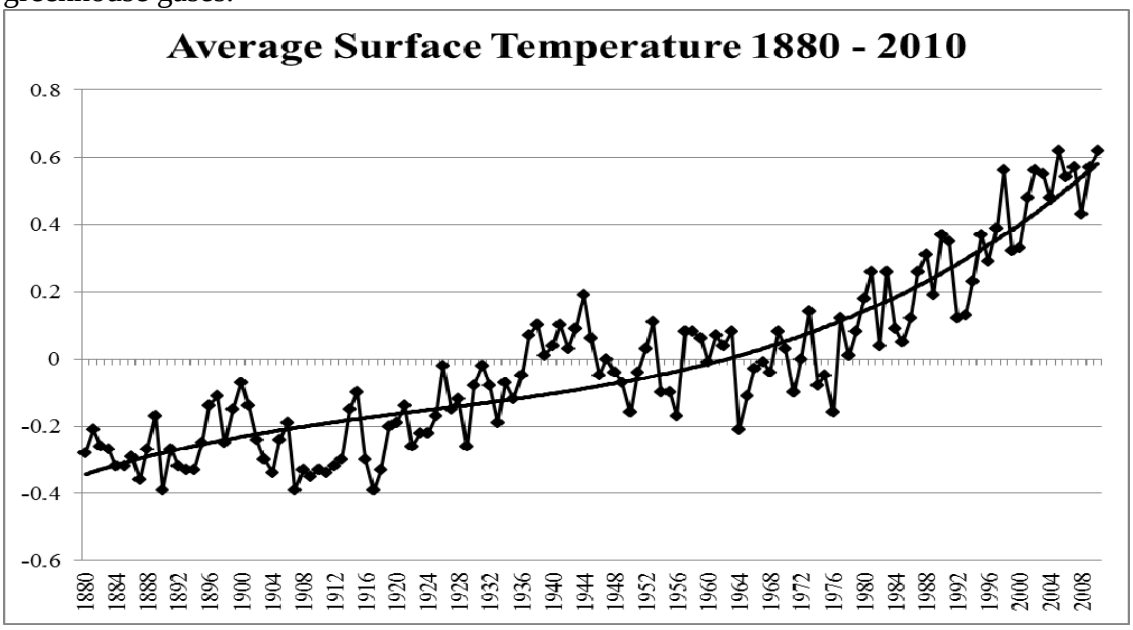
17. Consider again the game described in the previous question. Assume that X = 16, which makes the game a prisoners' dilemma if it is played only once. However, the game is played repeatedly. Which of the following statements is true?

a) An equilibrium in this kind of repeated game is commonly referred to as a mixed strategy equilibrium.
b) The firms will avoid a tit-for-tat strategy because such a strategy does not allow for collusion.
c) The possible Nash equilibrium outcomes are different if the game repeats 20 times rather than repeating indefinitely.
d) None of the above.

18. We often observe that decision-makers seem to make inconsistent choices under uncertainty. For example, decision-makers will often change their preferred choice when the outcomes are described or "framed" differently even when the actual payoffs are unchanged. One explanation for such an effect is

a) Asymmetric information in the form that a seller knows more than a buyer about the transaction under consideration.
b) Overoptimistic bias in that most people assume good events are more likely than they actually are.
c) **Prospect theory in that changing the frame changes the reference point and can shift a decision-maker from a risk averse choice to a risk-seeking choice.**
d) All of the above.

19. The following diagram shows the earth's average surface temperature for the period 1880 through 2010 (so far) relative to a base of 0 in 1960. The smooth line is a trend line obtained using the regression equation $T = f(Y) + e$, where T is temperature, $f(Y)$ stands for a function of the year, and e is a random error. This warming trend is believed to arise mainly from the effects of greenhouse gases.



Which of the following statements is true?

a) If we use the regression line to predict future temperatures we can eliminate the uncertainty associated with such forecasts.
b) If random error *e* has a high variance over time, we would expect large vertical deviations of the actual data points from the regression line.
c) If this warming trend can be explained to a wide range of people around the world this should resolve informational problems and therefore offset any underlying market failure.
d) None of the above.

20. Which of the following is an example of market failure?

a) When insuring farmers against insufficient rainfall, insurance companies charge a premium over and above the amount implied by (actuarially) fair insurance.
b) A corporation suffers losses in a competitive market and declares bankruptcy.
c) A monopoly firm using uniform pricing equates marginal revenue to marginal cost and thereby charges a price above marginal cost.
d) All of the above.

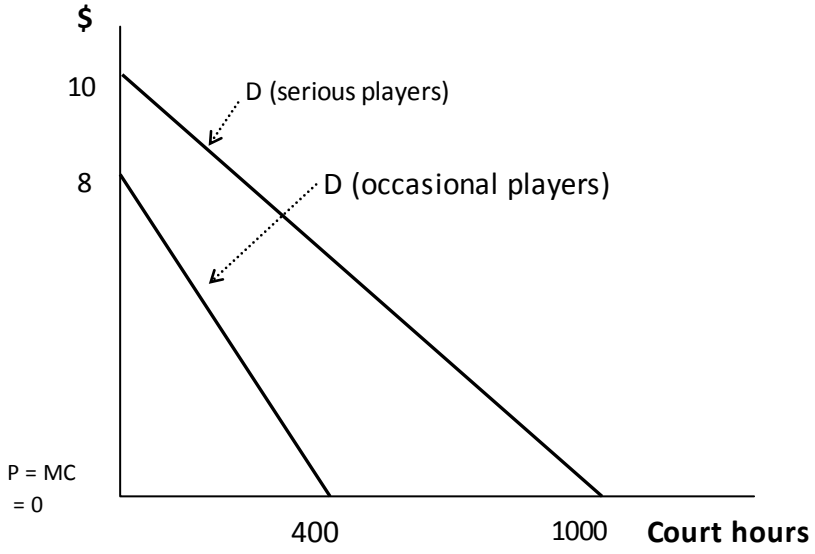
Part II

LONG ANSWER QUESTIONS

Answer only 4 of these 5 questions. If you answer all 5, only the first 4 will be graded. Please show your working and answer each question within the space provided.

1. Pricing with Market Power

(a) A tennis club serves two types of players: "serious" and "occasional" players. There are 100 players of each type. The aggregate demand of serious players is given by Q = 1000 - 100P and that of occasional players: Q = 400 - 50P, where Q = court hours per month and P = fee per hour for each individual player. The club has fixed costs of $2000 per month but the marginal cost of court time is zero: MC = 0. In a diagram show the aggregate inverse demand curve for each consumer type, including intercepts. If the club can charge different membership fees to the two different types of players (a discriminating two-part pricing system), what (monthly) membership fees and hourly fee would maximize the club's profit? What is the club's profit? (5 pts).



If the club can charge different membership fees then the profit-maximizing hourly fee P = MC = 0.

*Total membership fee for occasional players T_o = their consumer surplus (before membership fee) = 0.5*8*400 = $1,600*
Membership fee per occasional player t_o =1600/100 = $16
*Similarly, total membership fee for serious players T_s = 0.5*10*1000 = 5,000*
Membership fee per serious player t_s =5000/100 = $50

*Club's Profits = R(membership fees) - C = 0.5*8*400 +0.5*10*1000 - 2000 = $4,600.*

b) Now suppose that the club loses one of it tennis courts. As result it is limited to a maximum of 1100 hours of playing time per month. One possible response would be to charge a usage fee of *$x* per hour for all members. What value of *x* would limit usage to 1100 hours? Assume that the club can continue to charge different membership fees to the two groups. Calculate the change in the club's profit relative to part (a). (No diagram is needed.) (5 pts)

$Q^S + Q^O = 1000 – 100P + 400 – 50P = 1400 – 150P.$
Setting this quantity to 1100 yields 1400 – 150P = 1100 so P = (1400 – 1100)/1.50 = 2
Therefore x = 2.
OR
Serious players: Q = 1000 - 100P → P = 10 - 0.01Q; Occasional: Q = 400 - 50P → P = 8 - 0.02Q
If the club charges the same hourly fee X then
$X = 10 - 0.01Q_s = 8 - 0.02Q_o$
$0.01Q_s - 0.02Q_o = 2$ ..... (1)
Constraint: $Q_s + Q_o = 1100$ .....(2)
Solving (1) and (2), $Q_s = 800$ and $Q_o = 300$.
*Usage fee, X = 10 - 0.01*800 = $2.*

*Club's Profits = 0.5(8 + 2) *300+ 0.5*(10 + 2)800 - 2000 = $4,300*
The club makes 4600 - 4300 = $300 less profits than in part a).
(c) Paradise Vacations is the only local travel agency that sells vacation packages to Victoria, each of which consists of a round trip air ticket and a hotel. Paradise has no fixed costs but must pay $30 for each flight and $30 for each hotel room. There are 4 customer types and there are 10 consumers of each type. The following table shows the maximum willingness to pay (i.e. the reservation prices) for representative consumers of each type.

Reservation Prices ($)

Customer Type	**Flight**	**Hotel**
A	25	100
B	40	90
C	90	40
D	100	25

Consider two alternative pricing strategies: (1) pure bundling and (2) mixed bundling. For each strategy determine the profit maximizing prices to be charged and the resulting profits. Which strategy yields higher profits? (Hint: don't forget about the costs.) (5 pts)

Pure Bundling: *The best price for the bundle is $125. All consumers will buy one bundle each. Revenue R = 40*125 = $5,000 and Cost C =40*60 = $2,400 so Profit = $2,600.)*

Mixed Bundling: *The best prices are P_F = $100 and P_H = $100) P_b = $130. Consumers of type A will buy hotel only, consumers of type D will buy flight only and each consumer of types B and C will buy a bundle each. R = 20*100 + 20*130 = $4600 and C = 20*30+20*60 = $1800 for Profits = $2,800. Thus mixed bundling yields the higher profits.*

2. **Game Theory.**

a) The demand side of a market consists of 10 farmers, each of whom must purchase one tonne of potash per season to grow a crop. A market regulator has set a maximum price of $50 per tonne but will also allow a price of $30. No other prices are possible. An incumbent producer has no current costs and is currently selling potash to the 10 farmers at $50/tonne for a profit of $500 per season. An entrant with zero marginal cost and fixed cost equal to $80 is contemplating entering the market. If entry occurs each firm can charge either $50 or $30 (but nothing else). Farmers will purchase from the firm with the lowest price. If the same price is set, then the entrant and incumbent will each sell to 5 farmers.

Fill in the payoffs in the game matrix below assuming that entry takes place and that firms chooses prices simultaneously. Solve for the Nash equilibrium of the game and then briefly describe why the outcome of the game represents a prisoner's dilemma. (7 pts)

		Incumbent	
		Choose P = 30	Choose P = 50
Entrant	Choose P = 30	*70,150*	*220,0*
	Choose P = 50	*-80,300*	*170,250*

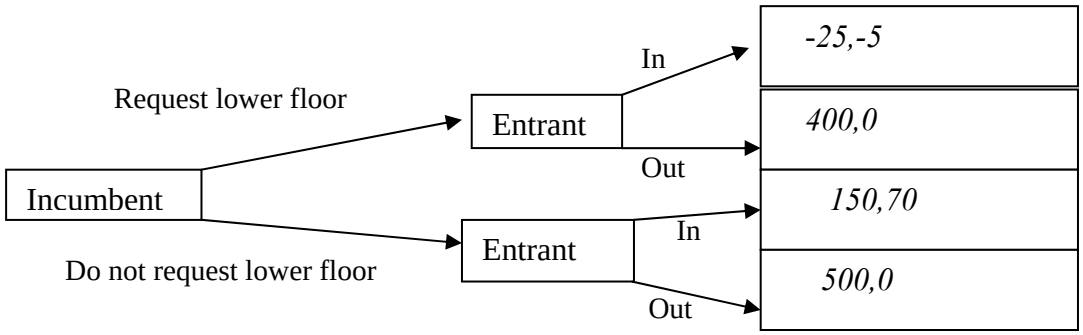
As shown in the matrix, the payoff to the entrant is first and the payoff to the incumbent is second. Students might reverse the order, putting the payoff to the incumbent first. That is okay. The payoff matrix would then look as follows.

		Incumbent	
		Choose P = 30	Choose P = 50
Entrant	Choose P = 30	*150, 70*	*0,220*
	Choose P = 50	*300,-80*	*250,170*

The Nash equilibrium occurs when each firm chooses a price of 30.
We can work out that P = 30 is the best response for each firm if the other firm charges 30, so it is a Nash equilibrium. In fact, it is a dominant strategy solution (which is a special type of Nash equilibrium) as P = 30 is a dominant strategy for each firm: the best choice it can make whatever the other firm does.

This solution is worse for both firms than the outcome when both firms charge 50.
Because we have a dominant strategy solution that is worse for both players than another outcome, the game is a prisoners' dilemma.

b) Prior to the entry decision the incumbent can ask the market regulator to reduce the permissible low price (the price floor) from $30/tonne to $15/tonne. The regulator will agree if the incumbent pays a $100 administration fee. Now if entry occurs each firm will set price at either $15/tonne or $50/tonne. The Nash equilibrium profits will now be -5 for the entrant and -25 for the incumbent if entry occurs. Fill in the payoffs in the sequential game tree shown below. Solve the game for the sequential (credible) Nash equilibrium to determine if the incumbent will pay $100 to the regulator in exchange for a reduction in the price floor. Briefly explain your answer. (8 pts)



The new Nash equilibrium is for the incumbent to request a lower price floor and for the entrant to stay out.

Explanation:

If the incumbent requests a lower price floor the entrant faces the choice of getting -5 if it enters and 0 if it stays out. Staying out is better so the entrant would stay out if the lower floor is in place.

If the incumbent did not request a lower price floor, then the entrant would want to enter.

From the incumbent's point of view the 400 it gets by paying the fee of 100 and keeping the market to itself is better that the 150 it would get by not requesting the lower price floor and having to accommodate entry. Therefore the incumbent would pay the fee of 100 to request a lower price floor and deter entry.

3. Uncertainty

a) Serena is considering two possible jobs. Both have uncertain incomes. She estimates the probabilities of the different possible weekly incomes as follows:

Job 1		Job 2	
Income	Probability	Income	Probability
		$0	40%
$900	50%	$2000	30%
$2500	50%	$6000	30%

The standard deviation of income for Job 1 is 800 and the standard deviation for Job 2 is about 2500. What can we say about the job choice Serena would make if she were risk seeking? What if she were risk neutral? And what if she were risk averse? Explain your reasoning briefly. (5 pts).

*The expected value for Job 1 is 0.5*900 + 0.5*2500 = 1700.*
*The expected value for Job 2 is 0.4*0 + 0.3*2000 + 0.3*6000 = 2400.*
If Serena is risk-seeking she would prefer Job 2 she like more expected value and more risk (high standard deviation) and Job 2 has more of both.

If Serena is risk-neutral she cares only about expected value and therefore chooses Job 2, which has higher expected value.

If Serena is risk averse we cannot say which she would prefer. There is a trade-off between higher expected value and higher risk. The extra expected value of Job 2 might or might not be enough to get her to take on the extra risk.

b) Now you are told that Serena's preferences can be represented by a utility function of the form $U = \sqrt{y}$ (i.e. $U = y^{0.5}$) where y is the weekly income. Determine the expected utility of Job 1. Show that the certain income that would provide the same expected utility as Job 1 is $1600. Calculate the risk premium and state briefly what it means. (5 pts). (No diagram is needed. You are asked for a diagram in part c.)

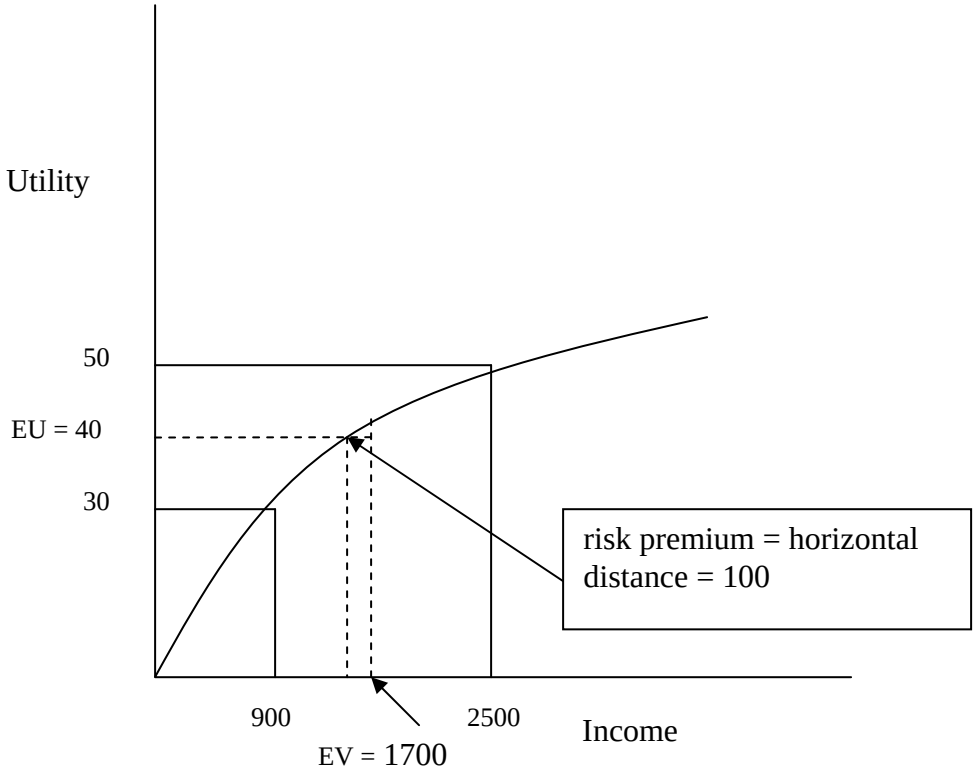
*EU = 0.5*U(900) + 0.5*U(2500) = 15 + 25 = 40.*

The certain income is the income level that would give a utility of 40. Therefore $40 = \sqrt{y}$ or $y = 40^2 = 1600$.

In this case the risk premium is 1700 – 1600 = 100.

The risk premium shows the amount a risk averse person would pay to avoid taking a risk. (Or the risk premium shows the extra expected value a risk averse person would have to receive in order to take on a particular risk). In this case for Serena a job that pays 1600 for certain is just as good as a job 1, which has an expected value of 1700. In effect, Serena would be willing to give up 100 to get a certain income.

c) Draw a diagram illustrating Serena's expected utility from Job 1. Put income on the horizontal axis and illustrate the utility function, the two possible outcomes, the expected value of income, the expected utility of income, and the risk premium. No explanation is needed but label the components in the diagram clearly and identify the relevant numbers on the axes. (5 pts)



4. Asymmetric Information

a. Ethan has been hired to manage a local clothing store. The store is owned by someone who lives in a different city and cannot observe Ethan's effort level. The profit of the store depends on some combination of luck and Ethan's effort as given by the following table. The numbers show the store's profit before any payments to Ethan are made.

	Bad Luck (p=.5)	Good Luck (p=.5)
Low Effort	20	40
High Effort	40	100

Ethan is risk neutral, his cost of low effort is 0 and his cost of high effort is 20. What effort level does Ethan provide if he is given a fixed wage of 6? What effort level does he provide if he receives 30% of the profit of the store? Is there an "agency problem" present with either contract? Explain briefly. (5 pts)

Ethan provides low effort if he is given a fixed wage of 6.
Ethan provides low effort if he receives 30% of the store's profit. The calculation is as follows:
*With a 30% profit share Ethan's expected return under low effort is given by: EV = 0.5*0.3*20 + 0.5*0.3*40 = 3 + 6 = 9.*
*with high effort: EV = 0.5*0.3*40 + 0.5*0.3*100 – 20 = 6 + 15 – 20 = 1.*
Since Ethan gets a higher expected value from providing low effort than from providing high effort he will choose low effort.
*Yes there is an agency problem. The problem arises with both contracts and is that the outcome is inefficient as total surplus is not maximized. Total surplus would be higher with high effort as total surplus is .5*40+.5*100 – 20 = 50 with high effort and is .5*20+.5*40 = 30 with low effort.*

b. Using the same data as in part a, now consider a bonus contract that pays Ethan 90% of any profit above 40 and nothing if profit is 40 or less. What effort level would Ethan provide now? Show that the owner prefers the bonus contract to both of the contracts considered in part a. (5 pts)

Ethan will now provide high effort.
EV with low effort is 0.
*EV with high effort is 0.5*0 + 0.5*0.9*(100-40) – 20 = 7.*
Therefore Ethan will provide high effort as it gives a higher expected value.
*The owner's return is 40 + 0.5*0.1*(100-40) = 43.*
With the fixed wage contract the owner gets 30 – 6 = 24.
*With the profit sharing the owner gets 0.7*30 = 21.*
As the owner gets a higher expected value with the bonus contract than with the other contracts, the owner would prefer the bonus contract.

c. Consider a market for used cars where sellers know the quality of cars and buyers do not. Good used cars are worth $10,000 to buyers. Poor used cars ("lemons") are worth only $5000 to buyers. Sellers of good used cars are willing to accept any price of $7000 or more and sellers of poor used cars will accept any price of $3000 or more. There are 100 cars that are potentially available to be sold. Buyers and sellers are risk neutral. Suppose that 20% of the available cars are of good quality. In the long run equilibrium how many good used cars will be sold? What is the selling price for the lemons? Explain briefly. (A diagram is not necessary but might be helpful.) (5 pts).

In the long run equilibrium no good used cars will be sold.
*If all cars would be sold the expected value of a car to a buyer would be 0.2*10000 + 0.8*5000 = 6000. However, sellers of good used cars would not accept this price, so they would not sell and only poor used cars would be sold.*

The selling price for lemons will be $5000.
There is a perfectly elastic demand at 5000. The supply of poor used cars is elastic at $3000 up to number available and is then perfectly inelastic so the equilibrium price is $5000.

5. Externalities

In a competitive market for cement in a particular region, the inverse demand function is given by P = 100 - Q and the (private) marginal cost of production is given by MC = 10 + Q, where Q is output in tonnes. (This MC curve also gives the industry supply curve.) The production of cement causes external damage given by the marginal external cost (MEC or MCE) curve MCE = 0.5Q.

a. Calculate the output and price of cement if it is produced under competitive market conditions without any government regulation. (No diagram is needed here. You are asked for a diagram in part c.) (4 pts)

Profit maximization under competitive conditions:
$P = MC$
$100 - Q = 10 + Q$
$Q_c = 45$
and $P_c = 10 + 45 = \$55$

b. Determine the efficient level of output and price of cement. What level of tax per unit of cement production would result in the efficient quantity? (6 pts)

Marginal social cost, $MCS = MC + MCE = 10 + 1.5\,Q$
At efficient solution:
$P = MCS$ *or*
$100 - Q = 10 + 1.5\,Q$
$Q^* = 36$
$P^* = 10 + 1.5^* 36 = \$64$

The tax rate that results in efficient solution, $t^* = MCE(Q^*) = 0.5^*36 = \$18$ *per tonne.*

c. Draw a diagram illustrating your results from parts a) and b). Show in your diagram the deadweight loss (DWL) caused by the competitive market outcome (without regulation). Also calculate the size (numerical value) of this DWL. (5 pts)

*MCS (Q_c) = 10+ 1.5*45 = 77.5*
Area of DWL triangle can be done in two pieces:
*upper piece: area = 0.5*9*(77.5-64) = .5*9*13.5 = 60.75*
*lower piece: area = 0.5*9*(64-55) = .5*9*9 = 40.5*
total = 101.25
or
DWL = 0.5 (MCS(Q_c) – P_c)(Q_c - Q^*) = 0.5(77.5 – 55)9 = $101.25.