1. Some people argue that the government should use lower discount rate for environmental project when conducting benefit-cost analysis. What is the main reason for doing so? (10')
(Open question, you can get full points if your arguments are strong and clear enough)

Environmental projects are different from other commodities, since sometimes they (environmental projects) are public goods, containing positive externality, which means environmental projects are always underprovided. In particular, their values also don't fall as rapidly as other commodities, and even their values are increasing over time. Lower discount rate is not only suitable for the commodity which has a stable value, but also effectively to give a project a higher present value, which means it can help attract more investments to this underprovided project.

2. What is the difference between moral hazard and adverse selection? Explain using examples that are NOT discussed in class.(10')
One side of a transaction knows about herself, but the other side does not. It is called *adverse selection*.
Example: buffet always attracts people who are able to eat a lot.

One side can take actions that the other side cannot observe. It is called *moral hazard*.
Example: subprime mortgages.

Or:
(1) adverse selection is derived from *ex-ante* asymmetric information: e.g., because the consumers do not the product, the company does more advertisement than before.
(2) moral hazard is derived from *ex-post* asymmetric information: e.g., workers don't work hard because their manager will not know that.

There are several other ways, for example, Arrow says adverse selection is `hidden information' while moral hazard is `hidden action'. Or more precisely in recent years, Tirole says asymmetric information from endogenous factors (variables) is moral hazard, while asymmetric information from exogenous factors (variables) refers to adverse selection.

3. Suppose that the probability of getting in an accident is 2%. The average cost of an accident is $50,000. Suppose that the average car driver has utility functions given by

$$U(I) = I^{1/3}$$

a) Assuming that this individual earns $100,000 per year in income, calculate his expected utility if he buys no insurance. (5')
U(100,000)= 46.42
U(100,000-50,000)= 36.84
E(Utility)=98%*46.42+2%*36.84=46.23
b) Calculate the amount this individual would be willing to pay for a full coverage insurance policy. (5')

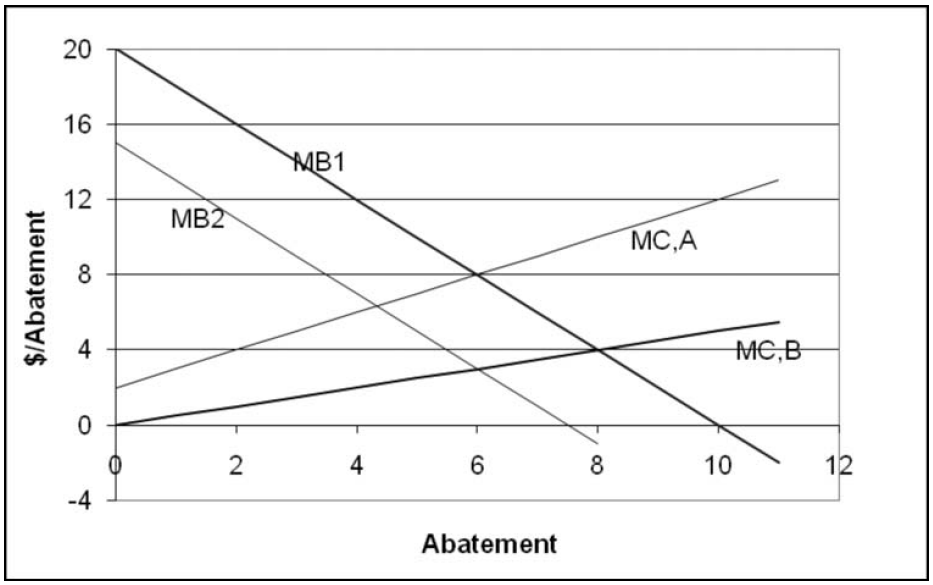
Given U(I-p)=46.23, p=100,000-46.23^3=1196.65

c) Repeat (a) and (b) for an individual who earns $50,000 per year. (5')
U(50,000)= 36.84
U(50,000-50,000)= 0
E(Utility)=98%*36.84=36.1
p=50,000-36.1^3=2954.12
d) How much should the insurance company charge for a policy if it can't discriminate between the two individuals? What should it charge if it can discriminate? (5')
The cost to the insurance company of an accident is $50,000(.02) = $1000.
If a non-discriminating company charges at $1196.65 to get both enroll, the net revenue will be 2*(1196.65-1000) = 393.3
If a non-discriminating company charges at $2954.12 to only get the poor enroll, the net revenue will be 2954.12-1000 = 1954.12 > 393.3

Hence, a non-discriminating company should charge at $2954.12 to only get the poor enroll to achieve profits maximization.

A discriminating company would charge rich people $1196.65 and poor people $2954.12 for the same policy

4. In the figure below, MB1 is the marginal benefit that town 1 gets from abatement; MB2 is the marginal benefit for town 2. MC, A is the marginal cost of abatement for source A, and MC, B is the marginal cost of abatement to source B. Use this figure to answer the following questions.



a) If source A is located in town 1, what is the efficient level of abatement for town 1? Why? (3')

If source A is in town 1, then MCA = MB1 when abatement = 6. For any abatement less than this level, the gains from more abatement exceed the costs; for any more abatement, the costs exceed the benefits.

b) If source B is located in town 1, what is the efficient level of abatement for town 1? (3')

If source B is in town 1, then MCB = MB1 when abatement = 8. For any abatement less than this level, the gains from more abatement exceed the costs; for any more abatement, the costs exceed the benefits.

c) If source A is located in town 1, what level of pollution tax will achieve the efficient level of pollution for town 1? Why will that level of tax achieve the efficient level? (4')

A tax of $8/unit of pollution will achieve the efficient level. Source A will consider, for each unit of abatement, whether it is more expensive to abate or to continue polluting and paying $8/unit. As long as the marginal costs of abatement are less than $8/unit, source A will abate. Its marginal abatement costs equal $8/unit for 6 units of abatement, the efficient amount.

d) If source B is located in town 1, what level of pollution tax will achieve the efficient level of pollution for town 1? Why will that level of tax achieve the efficient level? (4')

A tax of $4/unit of pollution will achieve the efficient level. Source B will consider, for each unit of abatement, whether it is more expensive to abate or to continue polluting and paying $4/unit. As long as the marginal costs of abatement are less than $8/unit, source B will abate. Its marginal abatement costs equal $4/unit for 8 units of abatement, the efficient amount.

e) If source A is in town 1, and if source B is in town 2, is a uniform pollution tax or a uniform pollution standard (that is, a tax or a standard that is the same in both places) more efficient? Why? (6')

Under the circumstances described, the efficient level of abatement for B in town 2 is also 6 units. In this case, a uniform standard will achieve the efficient amount of abatement in both towns. A tax that will achieve the efficient amount of abatement for source A in town 1, though, will not achieve the efficient amount of abatement for source B in town 2, or vice versa.

f) Suppose the government prefers to use a tax to regulate pollution, given your answer in (e), what kind of suggestions will you offer to the government? (5')

Given the same setting in (e), the government should impose a tax of $8/unit of pollution on source A and a tax of $3/unit of pollution on source B.

5. The following table gives information on visitors to Jellybear Park:

City of Origin	Population	Total Distance	Cost/Visit	Visit/Capita	Total Visits
Alabaster	1000	1	*$1*	*0.85*	*850*
Beautiful	3000	3	*$3*	*0.55*	*1,650*
Cornucopia	5000	5	*$5*	*0.25*	*1,250*
Delight	7000	7	*$7*	*0*	*0*

The only cost of traveling to the park is mileage, at $1/mile. The researcher estimates the relationship between costs and number of visits per capita (per person) to be Visits per capita = 1 – 0.15*Cost.

(a) Identifying total costs of a visit from each place, visits per capita from each town, and the total number of visits from each town (the visits/capita multiplied by the population) and filling the table. (6')

(b) Does the researcher observe anyone coming from Delight to Jellybear? Why? (4')

It's too expensive. From the equation, visits/capita is a negative number. Since negative visits are for physics or math, not economics, we assume visits from there is zero. And maybe it's a nice enough place that nobody ever wants to go elsewhere

(c) Because of management costs, park managers are considering charging for admission to Jellybear. They are considering prices ranging from $1/visit to $5/visit. For each whole dollar value between $1 and $5 per visit, figure out (i) the new cost of visiting for each town, (ii) the new number of visits/capita from each town, (iii) the new number of visits from each town, and (iv) the total visits (remember that negative visits do not exist; they count as zero). Fill in the following table (Total visits is the sum from each place). (7')

	Total	Alabaster			Beautiful			Cornucopia		
Admission Price	Visits	Cost / Visit	Visit/ Capita	Visits	Cost / Visit	Visit/ Capita	Visits	Cost/Visit	Visit/ Capita	Visits
$0	3750	$1	0.85	850	$3	0.55	1650	$ 5	0.25	1250
$1	2400	$2	0.7	700	$4	0.4	1200	$ 6	0.1	500
$2	1300	$3	0.55	550	$5	0.25	750	$ 7	0	0
$3	700	$4	0.4	400	$6	0.1	300	$ 8	0	0
$4	250	$5	0.25	250	$7	0	0	$ 9	0	0
$5	100	$6	0.1	100	$8	0	0	$10	0	0

(d) Put the information on admission price and total visits in the table from (c). This table shows the relationship between admission price and total number of visits. What is it? (2')

(e) Admission price	*Total visits*
0	*3,750*
$1	*2,400*
$2	*1,300*
$3	*7,00*
$4	*250*
$5	*100*

(e) Estimate the consumer surplus associated with visiting Jellybear Park when the admission fee is $0. (It will be an approximate value, because the relationship in (e) is not a straight line.) (6')

Quantity	3750	2400	1300	700	250	100
Price	$0	$1	$2	$3	$4	$5
Consumer Surplus	675	1650	1500	1575	675	550

Consumer surplus is the sum of the trapezoids, which is $6625.

0.5*(5+6)*100+0.5*(4+5)*(250-100)+0.5*(3+4)*(700-250)+0.5*(2+3)*(1300-700)+0.5*(1+2)*(2400-1300)+0.5*1*(3750-2400)=6625