MIDTERM, PUBLIC FINANCE (4054) NAME: _____

1. Suppose that I consume only two goods: milk and honey. Let x_1 be the quantity of milk I consume, let x_2 be the quantity of honey I consume, and let p_1 and p_2 represent the prices of milk and honey, respectively. If my total income is I, and my preferences over milk and honey can be represented by the Cobb-Douglas utility function $U(x_1, x_2) = x_1 x_2$, what is my demand function for milk, $x_1^*(p_1, p_2, I)$? _____

2. Suppose that I'm doing an empirical study of the effects of a particular independent variable x_1 on a dependent variable y, which also depends on the variable x_2, in addition to a random error term ε. Somehow, I know that values of y are determined by the following process, for all data points $i = 1, \dots, N$:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \varepsilon_i$$

I perform an OLS regression, calculating $\hat{\beta} = (x'x)^{-1}x'y$, and find that $\hat{\beta}_0 = 1000$, $\hat{\beta}_1 = .5$, and $\hat{\beta}_2 = -.7$. Thus, I estimate that if x_{i1} increases by 100 units, y_i should, on average, _____ (increase / decrease, by how much?)

Suppose that I also find that, in my data, x_1 and y are negatively correlated. What does this tell you about the relationships between x_1, y, and the other independent variable x_2?

3. Suppose I have a data set that measures, for each year in a certain range, both TANF ('welfare') payments, and the poverty rate. Suppose further that I find a positive correlation between TANF payments and poverty. Should I conclude that TANF payments have the effect of increasing poverty? Explain why or why not.

4. Which government is the single largest holder of US debt? _____

5. According to the OMB data used in the Gruber text (which I brought up to date in class), has there ever been a historical period in the last 100 years, in which the total public debt of the US federal government was higher, *as a share of GDP*, than it is today? _____ (Yes or no) If so, name this period; if not, name the period that has come closest.

6. During the July 2011 debt ceiling crisis, politicians debated over how to reduce long-term deficits. One of the main sticking points was the share of deficit reduction that should be achieved by revenue increases versus spending reductions. Approximately what ratio of revenue increases to spending cuts was proposed by President Obama? _____ Approximately what ratio of revenue increases to spending cuts was proposed by Speaker Boehner? _____ Leaving aside the outcome of the super-committee's negotiations, which is as yet unknown, what was the approximate ratio of revenue increases to spending cuts in the deficit reduction bill signed into law on 8/2/2011? _____

7. Suppose that there is a graduated income tax defined by the table below.

income bracket	marginal rate
\$0 - \$10,000	10%
\$10,000 - \$20,000	20%
\$20,000 - \$30,000	30%
\$30,000 and above	40%

If your taxable income is \$25,000, how much do you pay? _____

If your taxable income is \$50,000, how much do you pay? _____

8. Given a cap and trade program, name one advantage of conducting a 'full auction' of carbon permits, as opposed to giving them away for free.

9. In the market for gasoline, the marginal private benefit is given by $MB(Q) = 10 - \frac{1}{600}Q$, the marginal private cost is given by $2 + \frac{1}{1200}Q$, and the use of gasoline imposes on society an external cost of $1 per gallon. In the absence of any government intervention, the equilibrium quantity will be _____. If you were designing a cap and trade program, then you would recommend the socially optimal cap: _____ units of gasoline. Alternatively, we could reach the socially optimum quantity by imposing a tax of _____ per unit. By how much does total economic surplus increase, when either the optimal tax or the optimal cap and trade program is implemented? _____

10. Suppose that the market for pea soup is perfectly competitive and efficient in the absence of government intervention, and that supply and demand are determined by the aggregate marginal benefit function $MB(x) = 24 - \frac{1}{1000}x$ and the aggregate marginal cost function $MC(x) = 6 + \frac{1}{500}x$, where x is the quantity of pea soup, measured in gallons. If there is no tax, the equilibrium quantity will be _____, consumer surplus will be _____, producer surplus will be _____. If there is a tax of $3 per gallon of split pea soup, then the new equilibrium quantity will be _____, the new consumer surplus will be _____, the new producer surplus will be _____, the revenue from the tax will be _____, and the deadweight loss will be _____.

11. Suppose that at the beginning of 2005, my net worth was $10,000, and at the end of 2005, my net worth was $5,000. Suppose also that my consumption expenditure in 2005 was $20,000. What was my income in 2005, according to a Haig-Simons definition? _____

12. Name two reasons why we might want to take other things into account when calculating a person's income tax, other than his or her Haig-Simons income.

13. Suppose that there is a private good, with a market that is efficient in the absence of taxation, and a public good, that can only be provided by the government, using revenue from a per-unit tax of τ on the private good. Let the marginal benefit and cost for the private good (with quantity x) be as follows:

$$MB(x) = 24 - 2x \qquad\qquad MC(x) = x$$

Let the marginal benefit and cost of the public good (with quantity y) be as follows:

$$MB(y) = 21 - 2y \qquad\qquad MC(y) = 6$$

At the optimum level of taxing and spending, the shadow value of government revenue / shadow cost of government expenditure is $3/2$. Thus, if this shadow value is represented by $1 + \lambda$, then $\lambda = 1/2$. In all of the following problems, *show your work*, and box your answers.

13-1. Find the tax revenue function $R(\tau)$, the deadweight loss function $DWL(\tau)$.

13-2. Find the optimal per-unit tax τ^o, and the resulting revenue.

13-3. Find the optimal quantity of the public good y^o, and the resulting expenditure.

14. Name one possible advantage of a personal expenditure tax over a personal income tax, assuming that both are equally progressive.

15. Suppose that there is an income tax such that each person pays $T_i(Y_i) = \kappa + mY_i$, where Y_i is income, κ is a constant payment or credit, and m is a constant marginal rate. Suppose that $\kappa < 0$, so that, for example, someone with an income of zero receives a payment of $|\kappa|$ from the government. Is this tax system progressive, regressive, or proportional? _____
Sketch a proof for your answer in the space below.

16. A simple Keynesian prescription for macroeconomic stability is to perform deficit spending during economic downturns, and to create a budget surplus during more prosperous times, so that the budget is approximately balanced in the long run. Describe a reason why these guidelines might be difficult to implement, even if voters embrace them in principle, and even if politicians accurately represent the will of the majority.

Bonus problem: 'Leaky bucket redistribution.' Imagine a simple society in which there are only two people. Person 1 starts with income of $\omega_1 = 12$, and person 2 starts with income of $\omega_2 = 0$. There are no further possibilities for labor, production, exchange, etc.; the only way that person 2 can get any money is if we redistribute money from person 1 to person 2. Assume that we are only able to perform 'leaky bucket' redistribution, which means in this case that for every dollar that we take from person 1, only half a dollar is received by person 2. (The other half is wasted in the process.) Assume also that both people consume whatever income they have, post-redistribution. Thus, consumption is given by $c_1 = 12 - \rho$, and $c_2 = \frac{1}{2}\rho$, where ρ is the amount of money taken from person 1. Suppose that the utility functions for the two people are given by $U_1(c_1) = \sqrt{c_1}$ and $U_2(c_2) = \sqrt{c_2}$, and that the social welfare function is given by $W(U_1, U_2) = U_1 + U_2$. In order to maximize the social welfare function, we would choose $\rho =$_____, which implies $c_1 =$_____ and $c_2 =$_____. Show your work below. Also, sketch the utility possibility frontier (the axes are U_1 and U_2) if redistribution can be accomplished without 'leaks', and the utility possibility frontier given the constraints posed by redistribution being leaky. On this latter frontier, mark the point corresponding to your solution, and draw the social welfare indifference curve that passes through it.