**ECON 445**
Spring 2007
Professor Paul Rothstein

**Problem Set 4**
**Return this on or before April 27 at 5:00pm and receive 5 bonus points.**
**The official due date is noon, April 30.**
**Worth 35 Points (Fourteen question each worth 2.5 points)**
**Show all of your work!**

**Problem 1** (5 points)

The tax liability of a single individual depends on his or her taxable income and is given by a function $T^s : \Re_+ \to \Re$, called *the tax schedule for single individuals*. The tax liability of a married couple depends on the taxable incomes of both individuals and is given by some function $T^m : \Re_+^2 \to \Re$, called *the tax schedule for married couples*. Any pair $(T^s, T^m)$ is a *tax system*.

A tax system satisfies *marriage neutrality* if for all taxable incomes the tax liability of a married couple equals the sum of the payments each individual would make if single. Formally, for all $y \geq 0$ and $y' \geq 0$:

$$T^m(y, y') = T^s(y) + T^s(y')$$

The tax system contains a *marriage bonus* if there exist taxable incomes $y$ and $y'$ such that $T^m(y, y') < T^s(y) + T^s(y')$ and a *marriage tax* if $T^m(y, y') > T^s(y) + T^s(y')$.

1. Using the 2006 tax rate schedule (attached), show by example that the actual tax system contains a marriage bonus (hint: choose two individuals with very different taxable incomes).

2. Show by example that the actual tax system contains a marriage tax (hint: choose two individuals with very similar taxable incomes).

**Problem 2** (7.5 points)

Assume taxes exist ($t > 0$) but there are no deductions or credits. You derive utility over two kinds of spending, general consumption spending and spending to keep pythons out of your backyard.

The government now announces a tax deduction for home improvements intended to keep pythons out of your backyard. We will call this "python deterrence."

3. In a careful diagram, illustrate an initial equilibrium and final equilibrium in which the tax deduction induces you spend more on both python deterrence and general consumption.

4. In another diagram, illustrate the case in which you spend more on general consumption but no more on python deterrence.

   Explain how this is possible.

5. Suppose that instead of the tax deduction, the government gives you a tax credit for python deterrence. In a careful diagram, illustrate an initial equilibrium and final equilibrium in which the tax credit induces you spend more on both python deterrence and general consumption.

**Problem 3** (2.5 points)

A furniture manufacturer sells \$500,000 worth of tables, chairs, and other items in a given year. The manufacturer earns a profit of \$100,000 that year. His purchase invoices indicate that he brought \$200,000 worth of lumber, varnish, nails, and other materials during the year. His labor costs were \$150,000, and he purchased \$50,000 of new equipment that year.

6. Calculate his tax liability under a 15 percent consumption-type VAT.

**Problem 4** (7.5 points)

Suppose you have $1,000 in pre-tax income and your marginal income tax rate is 50%. You are considering two possible investment decisions:

7. Invest in a regular savings account earning 10% interest.

   What is the after-tax value of your savings a year from now?

8. Invest in an Individual Retirement Account (IRA) earning 10% interest.

   What is the after-tax value of your savings a year from now?

9. Why are your answers different?

**Problem 5** (2.5 points)

Suppose that there is a 25% chance that an investment of $1,000 will rise in value to $1,400, a 25% chance that the investment will remain at $1,000, and a 50% chance that the investment will fall in value to $500. The government introduces a 50% tax on returns to investment and allows a deduction against taxable income for any losses (assume that the tax rate is 50%).

10. What is the expected return on the investment?

**Problem 6** (2.5 points)

Suppose that Jack owns a warehouse in a rapidly expanding part of a town. Because of the location of the warehouse, it has increased in value from $300,000 (the price Jack paid) to $400,000 (the price Jack would get if he were to sell it). The doctor has recently told Jack that he has one year to liveand the doctor is always right about such things. The capital gains tax rate is 25%. Jack's wealth will be distributed among his children when he dies. The warehouse is not currently being used. Jack must decide whether to sell the warehouse now (and pass the cash on to his children) or take it with him to his grave. Assume that there is no estate tax but that the capital gains tax code is the same as that currently in place in the United States.

11. Suppose you are Jack's tax advisor. Which choice would you advice Jack to take to minimize his tax liability? Explain your answer.

12. Do you think this is efficient from the point of view of the overall economy? Why or why not?

**Problem 7** (7.5 points)

Consider a model in which individuals live for two periods and have utility functions of the form:

$$U(C_1, C_2) = \ln(C_1) + \ln(C_2)$$

They earn income of \$100 in the first period and save $S$ to finance consumption in the second period. The interest rate, $r$, is 10%.

13. Set up the individual's lifetime utility maximization problem. Solve for the optimal $C_1$, $C_2$, and $S$.

14. Suppose the government levies a 20% tax on interest income. Solve for the new optimal levels of $C_1$, $C_2$, and $S$. Explain any differences between the new and original level of savings, paying attention to income and substitution effects.

# 2006 Tax Rate Schedules


*The Tax Rate Schedules are shown so you can see the tax rate that applies to all levels of taxable income. Do not use them to figure your tax. Instead, see the instructions for line 44 that begin on page 36.*

**Schedule X—**If your filing status is **Single**

| If your taxable income is: *Over—* | *But not over—* | The tax is: | *of the amount over—* |
|---|---|---|---|
| $0 | $7,550 | **10%** | **$0** |
| 7,550 | 30,650 | **$755.00 + 15%** | **7,550** |
| 30,650 | 74,200 | **4,220.00 + 25%** | **30,650** |
| 74,200 | 154,800 | **15,107.50 + 28%** | **74,200** |
| 154,800 | 336,550 | **37,675.50 + 33%** | **154,800** |
| 336,550 | | **97,653.00 + 35%** | **336,550** |

**Schedule Y-1—**If your filing status is **Married filing jointly** or **Qualifying widow(er)**

| If your taxable income is: *Over—* | *But not over—* | The tax is: | *of the amount over—* |
|---|---|---|---|
| $0 | $15,100 | **10%** | **$0** |
| 15,100 | 61,300 | **$1,510.00 + 15%** | **15,100** |
| 61,300 | 123,700 | **8,440.00 + 25%** | **61,300** |
| 123,700 | 188,450 | **24,040.00 + 28%** | **123,700** |
| 188,450 | 336,550 | **42,170.00 + 33%** | **188,450** |
| 336,550 | | **91,043.00 + 35%** | **336,550** |

**Schedule Y-2—**If your filing status is **Married filing separately**

| If your taxable income is: *Over—* | *But not over—* | The tax is: | *of the amount over—* |
|---|---|---|---|
| $0 | $7,550 | **10%** | **$0** |
| 7,550 | 30,650 | **$755.00 + 15%** | **7,550** |
| 30,650 | 61,850 | **4,220.00 + 25%** | **30,650** |
| 61,850 | 94,225 | **12,020.00 + 28%** | **61,850** |
| 94,225 | 168,275 | **21,085.00 + 33%** | **94,225** |
| 168,275 | | **45,521.50 + 35%** | **168,275** |

**Schedule Z—**If your filing status is **Head of household**

| If your taxable income is: *Over—* | *But not over—* | The tax is: | *of the amount over—* |
|---|---|---|---|
| $0 | $10,750 | **10%** | **$0** |
| 10,750 | 41,050 | **$1,075.00 + 15%** | **10,750** |
| 41,050 | 106,000 | **5,620.00 + 25%** | **41,050** |
| 106,000 | 171,650 | **21,857.50 + 28%** | **106,000** |
| 171,650 | 336,550 | **40,239.50 + 33%** | **171,650** |
| 336,550 | | **94,656.50 + 35%** | **336,550** |