Answers to Some Old AS/ECON 4070 Final Exams

[Dec. 2001, #6] This question asked for the marginal tax rates for a tax schedule with 3 brackets, with a basic personal tax credit of $1000 and a non–refundable child tax credit of $5000 with was subject to a clawback rate of 20 percent on income above $40,000.

The first bracket was 0 to $30,000, with a tax rate of 25 percent. So for someone whose income was $30,000 or less, her tax payable (in thousands of dollars) would be

$$(0.25)Y - 6$$

if her income (in thousands of dollars) was Y. The 6 in the above equation represents the sum of the $1000 basic tax credit and the $5000 children's tax credit.

But her tax payable cannot be negative. So if $(0.25)Y < 6$, then she pays no tax at all. $(0.25)Y = 6$ when $Y = 24$.

So people whose income is $24,000 or less pay no tax ; their taxes owing (at a 25 percent marginal rate) would be less than the credit.

People whose income is between $24,000 and $30,000 face a marginal tax rate of 25 percent.

At $30,000, the marginal tax rate goes up to 35 percent.

But then at $40,000, the children's tax credit is reduced by 20 cents for every extra dollar earned. If a person's income Y (in thousands of dollars) were just above 40, then her tax credits would be $1 + 5 - (0.2)(Y - 40)$ where the last term represents the clawback. Her total tax payable would be

$$(0.25)(30) + (0.35)(Y - 30) - 6 + (0.2)(Y - 40) = 0.55Y - 11$$

She faces a marginal rate of 55 percent : the "official" marginal rate of 35 percent plus the clawback rate of 20 percent on the children's tax credit.

But the children's tax credit gets reduced to 0 when $(0.2)(Y - 40) = 5$, or $Y = 65$.

Her marginal tax rate also goes up at $Y = 60$. For income between $60,000 and $65,000 the person faces an effective marginal rate of 60 percent, the statutory rate of 40 percent, plus the clawback rate of 20 percent. Here her taxes are

$$(0.25)(30) + (0.35)(60 - 30) + (0.4)(Y - 60) - 6 + (0.2)(Y - 40) = 0.6Y - 14$$

Finally, at $65,000 the children's tax credit has been clawed back completely. At higher levels of income she faces a marginal rate of 40 percent, and her taxes owing are

$$(0.25)(30) + (0.35)(60 - 30) + (0.4)(Y - 60) - 1 = 0.4Y - 7$$

In summary, her marginal rate is

0 if her income is less than \$24,000

25 % if her income is between \$24,0000 and \$30,000

35 % if her income is between \$30,000 and \$40,000

55% if her income is between \$40,000 and \$60,000

60% if her income is between \$60,000 and \$65,000

40% if her income is greater than \$65,000

[Dec. 2000,#6] Here the "basic tax" is 25% of all income, but there is a surtax payable if the basic tax exceeds \$10,000, and a basic credit which is clawed back at a rate of 20% on incomes above \$25,000.

If her income is low, then her tax payable is 0. This is the case if 1/4 of her income is less than the basic tax credit of \$5000 , that is if her income is less than \$20,000.

The tax credit (in thousands of dollars) is 5 if income Y (in thousands of dollars) is 25 or less, and is $5 - (0.2)(Y - 25)$ if $Y > 25$. This falls to zero when $5 - (0.2)(Y - 25) = 0$, or $Y = 50$.

When is the basic tax greater than \$10,000? Since the marginal tax rate is 25 %, a person's basic tax is \$10,000 when her income is \$40,000.

Combining the cases, her taxes payable (in thousands of dollars) $T(Y)$ as a function of her income (in thousands of dollars) Y are

$T(Y) = 0$ if $Y \leq 20$; the marginal rate is zero

$T(Y) = (0.25)Y - 5$ if $20 < Y \leq 25$; the marginal rate is 25%

$T(Y) = (0.25)Y - 5 + (0.2)(Y - 25) = (0.45)Y - 10$ if $25 < Y \leq 40$; the 20% clawback makes her effective marginal rate 45%

$T(Y) = (0.25)Y - 5 + (0.2)(Y - 25) + (0.2)((0.25)Y - 10) = (0.5)Y - 12$ if $40 < Y \leq 50$; the surtax rate is 20% of 25%, so adding in the surtax raises the marginal rate to 50%

$T(Y) = (0.25)Y + (0.2)((0.25)Y - 10) = (0.3)Y - 2$ if $Y > 50$; the tax credit has been clawed back to 0 at $Y = 50$, so the marginal rate is only 30 % when $Y > 50$

[Feb 01 #6] There seems to be a typo in this one! The question said that the surtax, applicable for people whose income exceeded \$60,000, of 20 percent of "all income". If that was the case, then a person's tax payable would suddenly jump by \$12,000 as her income went from \$59,999.99 to \$60,000.01! A less drastic version, which I will answer here, is for the surtax to be 20 percent of all income **in excess of \$60,000**.

The basic tax credit here is 10 (measuring everything in thousands of dollars). But if a person's income exceeds 40, the credit is clawed back at a 20% rate. So the tax credit is $10 - (0.2)(Y - 40)$ if $Y > 40$. This credit falls to 0 when $10 - (0.2)(Y - 40) = 0$, or when $Y = 90$.

The basic tax rate is 20 %. So a person of income 40 would actually still have no tax to pay. Her basic tax would be 20% of 40, or 8, which is less than the tax credit.

So if $Y < 40$, then the credit exceeds the basic tax payable, the net tax is zero, and the effective marginal rate is 0. The tax does not become positive until $(0.2)Y$ equals the tax credit. When $Y > 40$, the tax credit is $10 - (0.2)(Y - 40)$, so the tax is zero until $(0.2)Y = 10 - (0.2)(Y - 40)$, or $Y = 45$.

Hence

i if $0 \leq Y \leq 45$ then $T(Y) = 0$ and the marginal rate is 0

For income levels between 45 and 60, the tax is positive, there is no surtax, and the tax credit is being clawed back.

ii if $45 < Y \leq 60$, $T(Y) = (0.2)Y - 10 + (0.2)(Y - 40) = (0.4)Y - 18$, so that the effective marginal rate is 40 %

At $Y = 60$, the surtax is applicable.

iii if $60 < Y \leq 90$, $T(Y) = (0.2)Y - 10 + (0.2)(Y - 40) + (0.2)(Y - 60) = (0.6)Y - 30$, so that the effective marginal rate is 60% : the basic rate, plus the clawback rate for the tax credit, plus the surtax

At $Y = 90$, the basic credit has been clawed back to 0. So

iv if $Y > 90$, $T(Y) = (0.2)Y + (0.2)(Y - 60) = (0.4)Y - 12$; the effective marginal rate is 40%, the basic rate plus the surtax rate