Functions

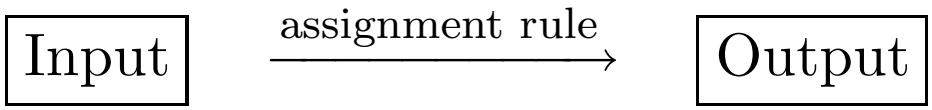
Math 140 - Calculus I

Catalin Zara

UMass Boston

September 8, 2009

Functions



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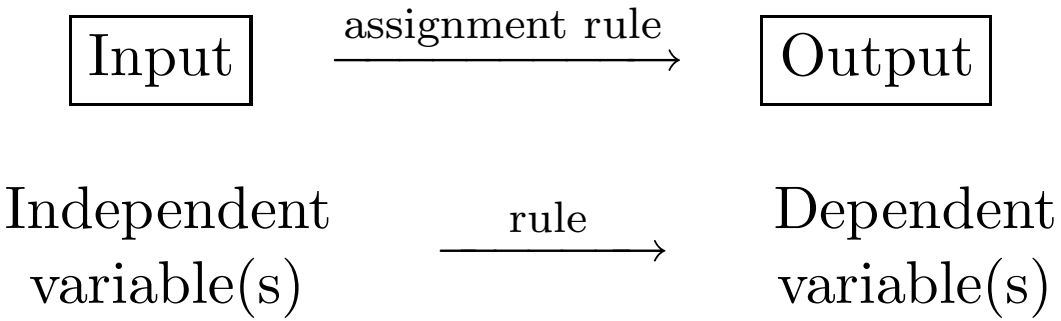
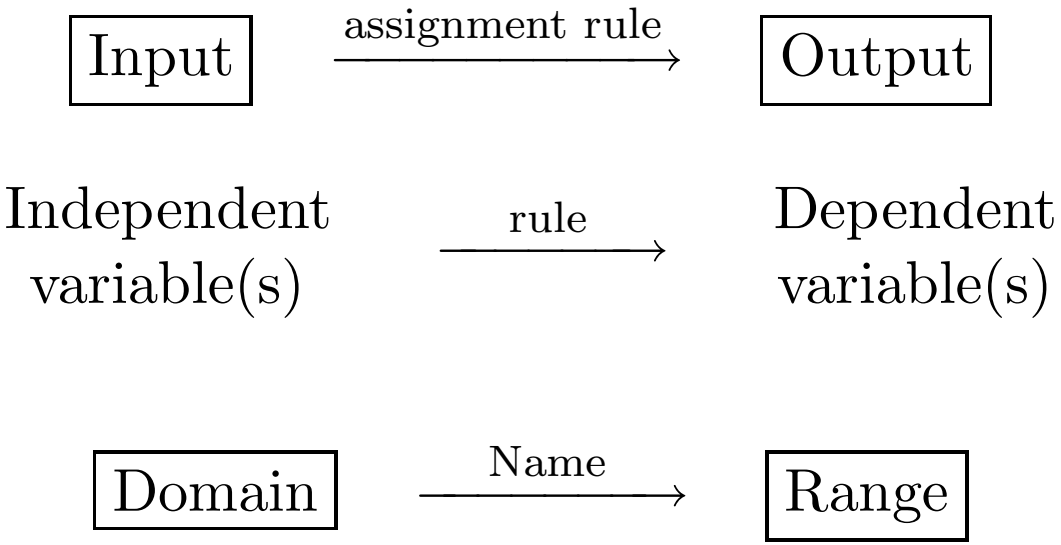

Input
assignment rule
Output
Independent variable(s)
rule
Dependent variable(s)

Functions


Input
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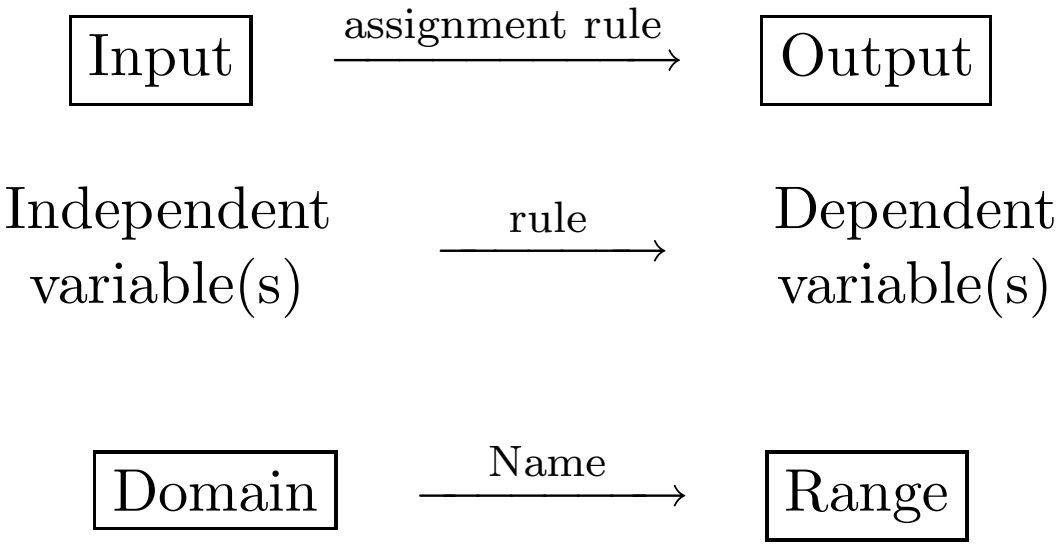
rule
Dependent variable(s)
Domain
Name
Range

Functions



$$\text{Name}: \text{Domain} \to \text{Range}$$

$$f: \mathbb{R} \to \mathbb{R} \quad , \quad y = f(x)$$

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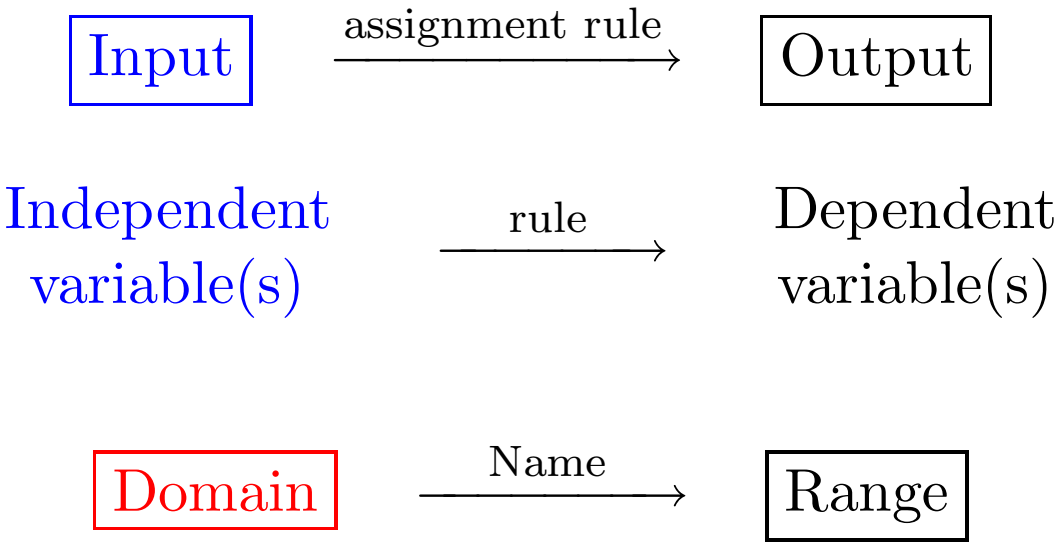

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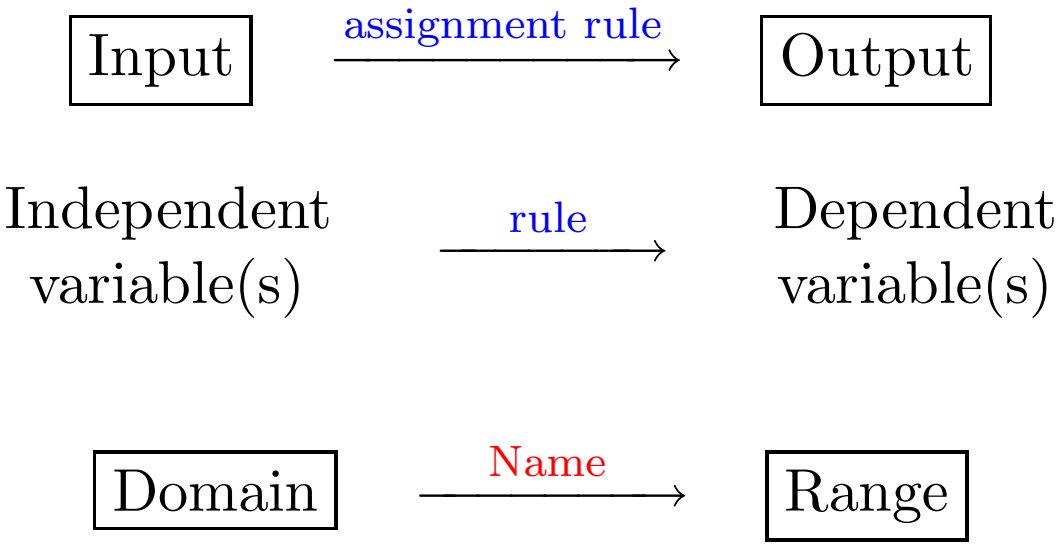

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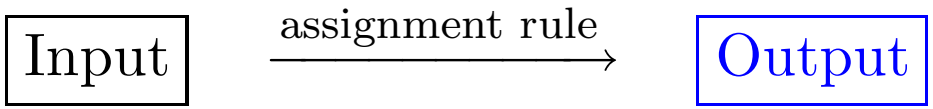

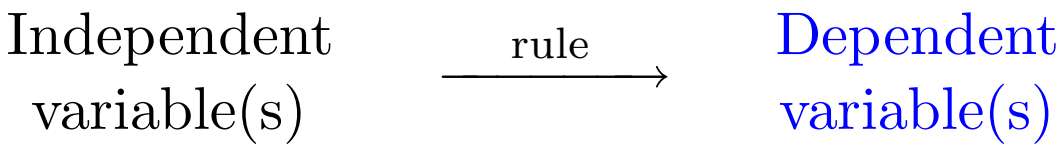

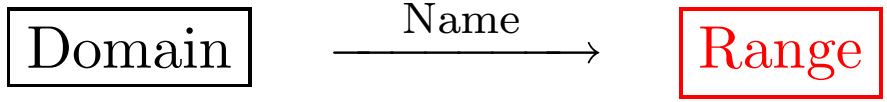

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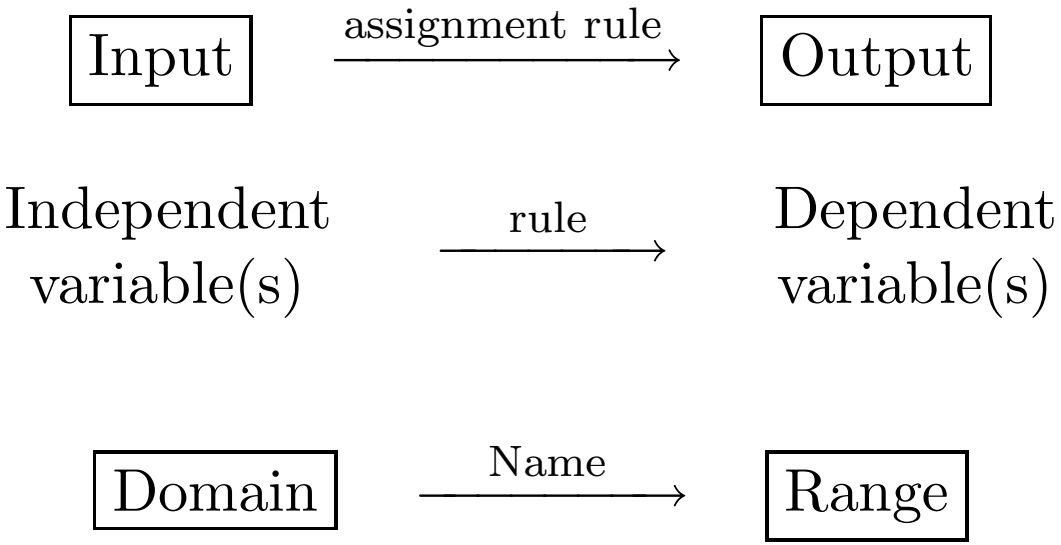

$$\text{Name}: \text{Domain} \to \text{Range}$$

$$f : \mathbb{R} \to \mathbb{R} \quad , \quad y = f(x)$$

Read: "y equals f of x"
Catastrophic mistake: "y equals f times x"

Verbal Representation of Functions

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
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If your taxable income is over 31,850 but not over 77,100, then the tax is 4,386.25 + 25% of the amount over 31,850.

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- Dependent var:

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$$g\colon [0,\infty) \to [0,\infty),\ T = g(ti)$$

Numerical Representation of Functions

Example: Taxable income of \$50505

Numerical Representation of Functions

Example: Taxable income of \$50505

"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 33."

Numerical Representation of Functions

Example: Taxable income of $50505

If line 43 (taxable income) is—		And you are—			
At least	But less than	Single	Married filing jointly *	Married filing separately	Head of a household
		Your tax is—			
50,000					
50,000	**50,050**	8,930	6,721	8,930	7,681
50,050	**50,100**	8,943	6,729	8,943	7,694
50,100	**50,150**	8,955	6,736	8,955	7,706
50,150	**50,200**	8,968	6,744	8,968	7,719
50,200	**50,250**	8,980	6,751	8,980	7,731
50,250	**50,300**	8,993	6,759	8,993	7,744
50,300	**50,350**	9,005	6,766	9,005	7,756
50,350	**50,400**	9,018	6,774	9,018	7,769
50,400	**50,450**	9,030	6,781	9,030	7,781
50,450	**50,500**	9,043	6,789	9,043	7,794
50,500	**50,550**	9,055	6,796	9,055	7,806
50,550	**50,600**	9,068	6,804	9,068	7,819
50,600	**50,650**	9,080	6,811	9,080	7,831
50,650	**50,700**	9,093	6,819	9,093	7,844
50,700	**50,750**	9,105	6,826	9,105	7,856
50,750	**50,800**	9,118	6,834	9,118	7,869
50,800	**50,850**	9,130	6,841	9,130	7,881
50,850	**50,900**	9,143	6,849	9,143	7,894
50,900	**50,950**	9,155	6,856	9,155	7,906
50,950	**51,000**	9,168	6,864	9,168	7,919

Numerical Representation of Functions

Example: Taxable income of $50505

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		Your tax is—			
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50,050	**50,100**	8,943	6,729	8,943	7,694
50,100	**50,150**	8,955	6,736	8,955	7,706
50,150	**50,200**	8,968	6,744	8,968	7,719
50,200	**50,250**	8,980	6,751	8,980	7,731
50,250	**50,300**	8,993	6,759	8,993	7,744
50,300	**50,350**	9,005	6,766	9,005	7,756
50,350	**50,400**	9,018	6,774	9,018	7,769
50,400	**50,450**	9,030	6,781	9,030	7,781
50,450	**50,500**	9,043	6,789	9,043	7,794
50,500	**50,550**	9,055	6,796	9,055	7,806
50,550	**50,600**	9,068	6,804	9,068	7,819
50,600	**50,650**	9,080	6,811	9,080	7,831
50,650	**50,700**	9,093	6,819	9,093	7,844
50,700	**50,750**	9,105	6,826	9,105	7,856
50,750	**50,800**	9,118	6,834	9,118	7,869
50,800	**50,850**	9,130	6,841	9,130	7,881
50,850	**50,900**	9,143	6,849	9,143	7,894
50,900	**50,950**	9,155	6,856	9,155	7,906
50,950	**51,000**	9,168	6,864	9,168	7,919

50,400	**50,450**	9,030
50,450	**50,500**	9,043
50,500	**50,550**	9,055
50,550	**50,600**	9,068
50,600	**50,650**	9,080
50,650	**50,700**	9,093

Numerical Representation of Functions

Example: Taxable income of \$50505 $\Longrightarrow$ Tax of \$9055.

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50,050	**50,100**	8,943	6,729	8,943	7,694
50,100	**50,150**	8,955	6,736	8,955	7,706
50,150	**50,200**	8,968	6,744	8,968	7,719
50,200	**50,250**	8,980	6,751	8,980	7,731
50,250	**50,300**	8,993	6,759	8,993	7,744
50,300	**50,350**	9,005	6,766	9,005	7,756
50,350	**50,400**	9,018	6,774	9,018	7,769
50,400	**50,450**	9,030	6,781	9,030	7,781
50,450	**50,500**	9,043	6,789	9,043	7,794
50,500	**50,550**	9,055	6,796	9,055	7,806
50,550	**50,600**	9,068	6,804	9,068	7,819
50,600	**50,650**	9,080	6,811	9,080	7,831
50,650	**50,700**	9,093	6,819	9,093	7,844
50,700	**50,750**	9,105	6,826	9,105	7,856
50,750	**50,800**	9,118	6,834	9,118	7,869
50,800	**50,850**	9,130	6,841	9,130	7,881
50,850	**50,900**	9,143	6,849	9,143	7,894
50,900	**50,950**	9,155	6,856	9,155	7,906
50,950	**51,000**	9,168	6,864	9,168	7,919

Analytical Representation of Functions

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

If your taxable income is over 31,850 but not over 77,100, then the tax is 4,386.25 + 25% of the amount over 31,850.

Analytical Representation of Functions

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

If your taxable income is over 31,850 but not over 77,100, then the tax is 4,386.25 + 25% of the amount over 31,850.

- Taxable income: ti, $31850 \leqslant ti \leqslant 77100$

Analytical Representation of Functions

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

If your taxable income is over 31,850 but not over 77,100, then the tax is 4,386.25 + 25% of the amount over 31,850.

- Taxable income: ti, $31850 \leqslant ti \leqslant 77100$
- Amount over 31850: $ti - 31850$

Analytical Representation of Functions

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

If your taxable income is over 31,850 but not over 77,100, then the tax is 4,386.25 + 25% of the amount over 31,850.

- Taxable income: ti, $31850 \leqslant ti \leqslant 77100$
- Amount over 31850: $ti - 31850$
- 25% of amount over 31850: $0.25(ti - 31850)$

Analytical Representation of Functions

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

If your taxable income is over 31,850 but not over 77,100, then the tax is 4,386.25 + 25% of the amount over 31,850.

- Taxable income: ti, $31850 \leqslant ti \leqslant 77100$
- Amount over 31850: $ti - 31850$
- 25% of amount over 31850: $0.25(ti - 31850)$
- Tax due: $4386.25 + 0.25(ti - 31850)$

Analytical Representation of Functions

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

If your taxable income is over 31,850 but not over 77,100, then the tax is 4,386.25 + 25% of the amount over 31,850.

- Taxable income: ti, $31850 \leqslant ti \leqslant 77100$
- Amount over 31850: $ti - 31850$
- 25% of amount over 31850: $0.25(ti - 31850)$
- Tax due: $4386.25 + 0.25(ti - 31850)$

$$T = f(ti) = 4386.25 + 0.25(ti - 31850)$$

Analytical Representation of Functions

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

If your taxable income is over 31,850 but not over 77,100, then the tax is 4,386.25 + 25% of the amount over 31,850.

- Taxable income: ti, $31850 \leqslant ti \leqslant 77100$
- Amount over 31850: $ti - 31850$
- 25% of amount over 31850: $0.25(ti - 31850)$
- Tax due: $4386.25 + 0.25(ti - 31850)$

$$T = f(50505) = 4386.25 + 0.25(50505 - 31850) = 9050$$

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

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

If your taxable income is:		The tax is:	
Over—	*But not over—*		*of the amount over—*
$0	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

$$T = f(ti)$$

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	$7,825	..... **10%**	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ \end{cases}$$

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	$7,825	..... 10%	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \end{cases}$$

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	$7,825	10%	$0
7,825	31,850	$782.50 + 15%	7,825
31,850	77,100	4,386.25 + 25%	31,850
77,100	160,850	15,698.75 + 28%	77,100
160,850	349,700	39,148.75 + 33%	160,850
349,700		101,469.25 + 35%	349,700

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \end{cases}$$

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	$7,825	..... 10%	$0
7,825	31,850	$782.50 + 15%	7,825
31,850	77,100	4,386.25 + 25%	31,850
77,100	160,850	15,698.75 + 28%	77,100
160,850	349,700	39,148.75 + 33%	160,850
349,700	.....	101,469.25 + 35%	349,700

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \end{cases}$$

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	$7,825	..... 10%	$0
7,825	31,850	$782.50 + 15%	7,825
31,850	77,100	4,386.25 + 25%	31,850
77,100	160,850	15,698.75 + 28%	77,100
160,850	349,700	39,148.75 + 33%	160,850
349,700	.....	101,469.25 + 35%	349,700

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \\ 39148.75 + 0.33(ti - 160850) & \text{if } 160850 < ti \leqslant 349700 \end{cases}$$

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	$7,825	..... 10%	**$0**
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31,850	77,100	**4,386.25 + 25%**	**31,850**
77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \\ 39148.75 + 0.33(ti - 160850) & \text{if } 160850 < ti \leqslant 349700 \\ 101469.25 + 0.35(ti - 349700) & \text{if } 349700 < ti \end{cases}$$

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	$7,825	..... 10%	**$0**
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77,100	160,850	**15,698.75 + 28%**	**77,100**
160,850	349,700	**39,148.75 + 33%**	**160,850**
349,700	.....	**101,469.25 + 35%**	**349,700**

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \\ 39148.75 + 0.33(ti - 160850) & \text{if } 160850 < ti \leqslant 349700 \\ 101469.25 + 0.35(ti - 349700) & \text{if } 349700 < ti \end{cases}$$

- To compute $f(20000)$:

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	$7,825	..... 10%	**$0**
7,825	31,850	**$782.50 + 15%**	**7,825**
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$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \\ 39148.75 + 0.33(ti - 160850) & \text{if } 160850 < ti \leqslant 349700 \\ 101469.25 + 0.35(ti - 349700) & \text{if } 349700 < ti \end{cases}$$

- To compute $f(20000)$: $ti = 20000$

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	$7,825	..... 10%	$0
7,825	31,850	$782.50 + 15%	7,825
31,850	77,100	4,386.25 + 25%	31,850
77,100	160,850	15,698.75 + 28%	77,100
160,850	349,700	39,148.75 + 33%	160,850
349,700	.....	101,469.25 + 35%	349,700

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \\ 39148.75 + 0.33(ti - 160850) & \text{if } 160850 < ti \leqslant 349700 \\ 101469.25 + 0.35(ti - 349700) & \text{if } 349700 < ti \end{cases}$$

- To compute $f(20000)$: $ti = 20000$

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	$7,825	..... 10%	$0
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77,100	160,850	15,698.75 + 28%	77,100
160,850	349,700	39,148.75 + 33%	160,850
349,700	.....	101,469.25 + 35%	349,700

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \\ 39148.75 + 0.33(ti - 160850) & \text{if } 160850 < ti \leqslant 349700 \\ 101469.25 + 0.35(ti - 349700) & \text{if } 349700 < ti \end{cases}$$

- To compute $f(20000)$: $ti = 20000$
- $f(20000)$

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	$7,825	..... 10%	$0
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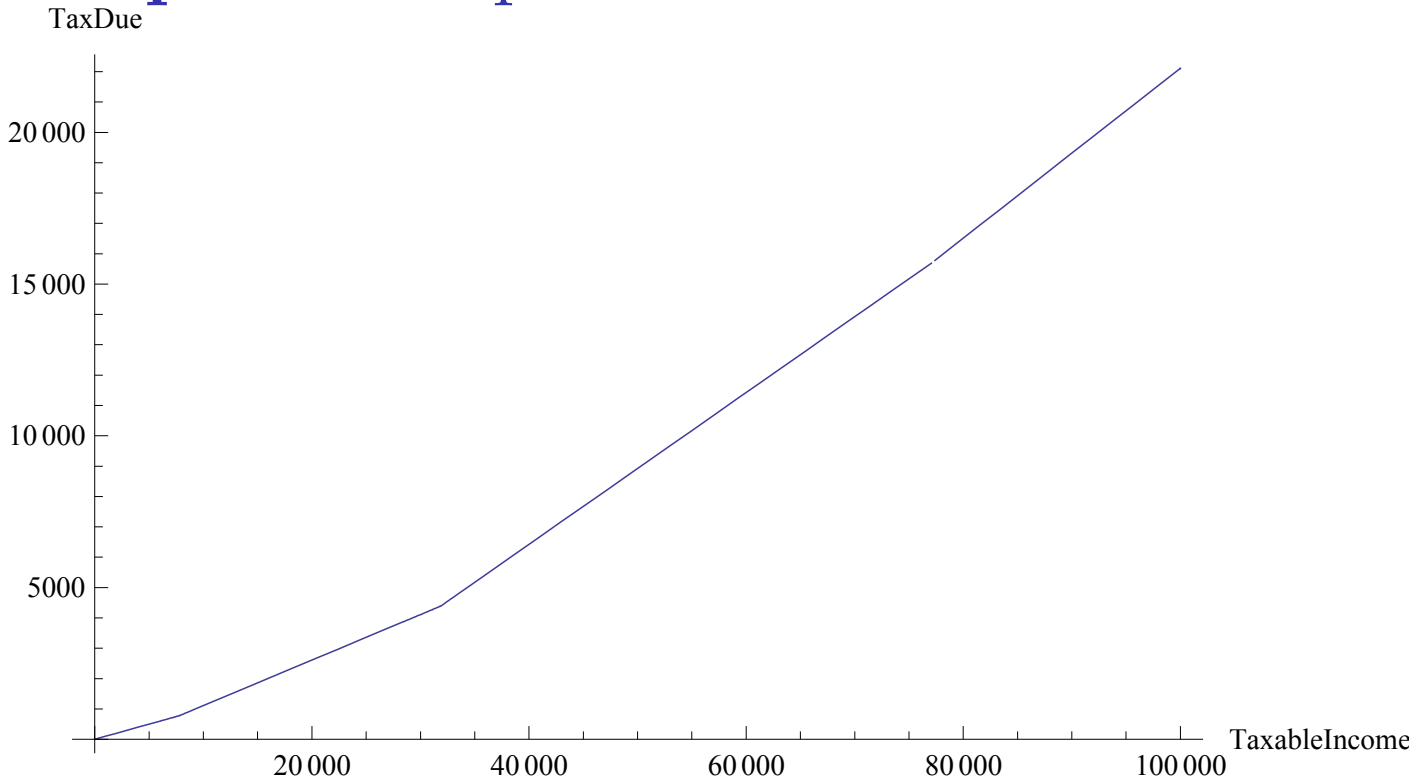
31,850	77,100	4,386.25 + 25%	31,850
77,100	160,850	15,698.75 + 28%	77,100
160,850	349,700	39,148.75 + 33%	160,850
349,700	.....	101,469.25 + 35%	349,700

$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \\ 39148.75 + 0.33(ti - 160850) & \text{if } 160850 < ti \leqslant 349700 \\ 101469.25 + 0.35(ti - 349700) & \text{if } 349700 < ti \end{cases}$$

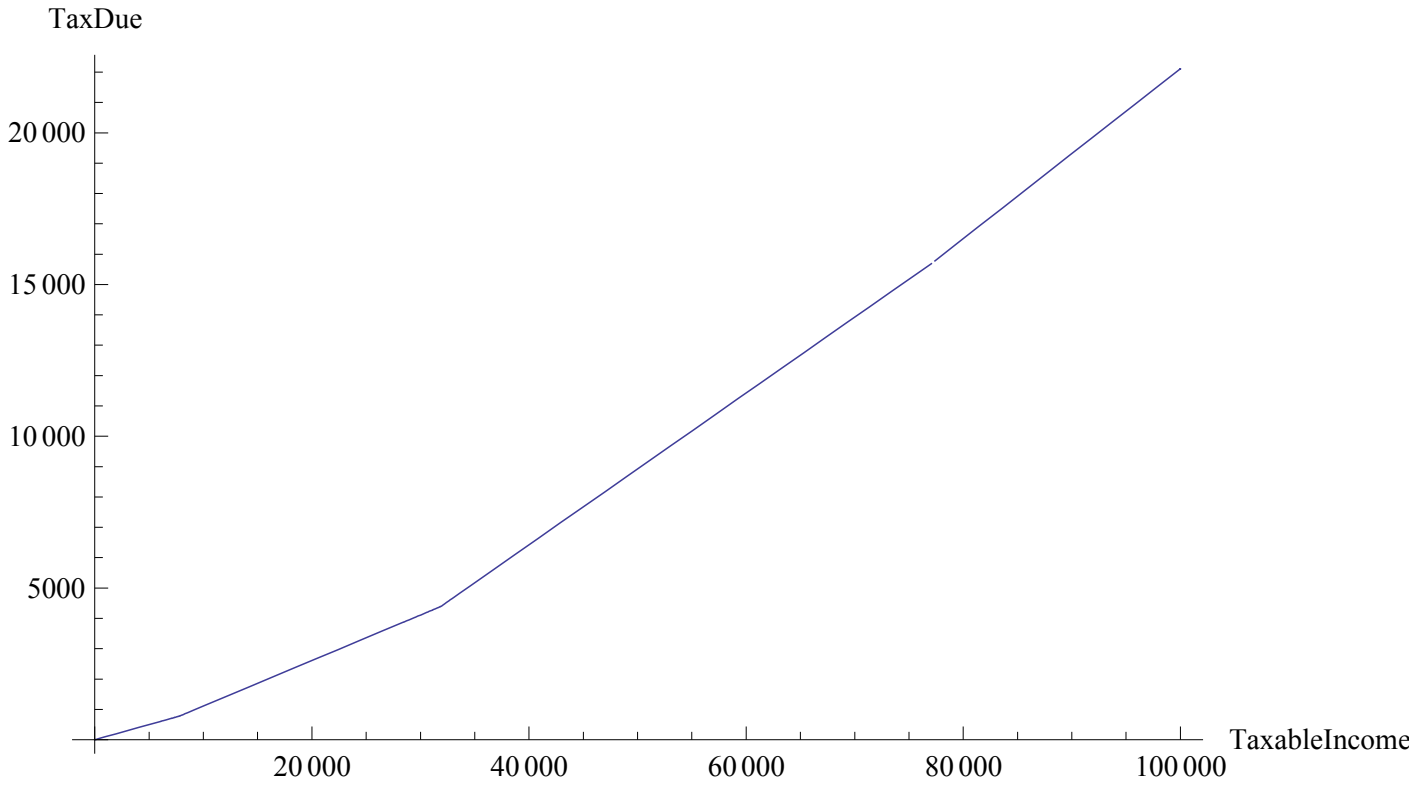
- To compute $f(20000)$: $ti = 20000$
- $f(20000) = 782.5 + 0.15(20000 - 7825) = 2608.75$

Graphical Representation of Functions

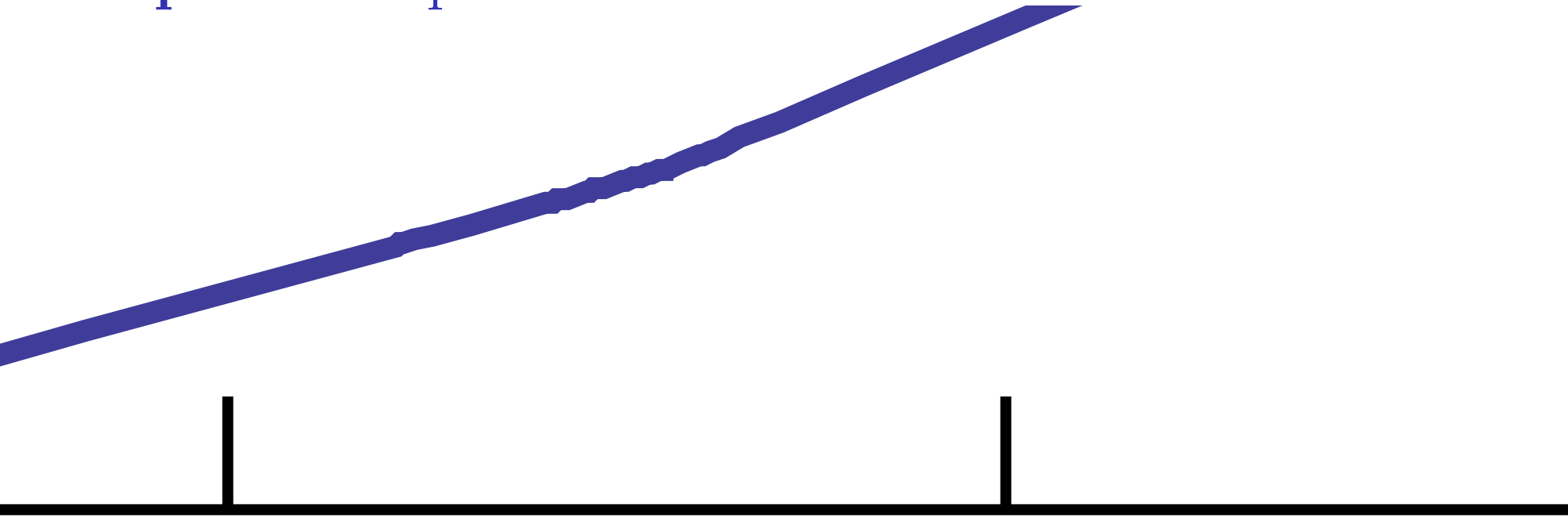


$$T = f(ti) = \begin{cases} 0.1ti & \text{if } 0 < ti \leqslant 7825 \\ 782.5 + 0.15(ti - 7825) & \text{if } 7825 < ti \leqslant 31850 \\ 4386.25 + 0.25(ti - 31850) & \text{if } 31850 < ti \leqslant 77100 \\ 15698.75 + 0.28(ti - 77100) & \text{if } 77100 < ti \leqslant 160850 \\ \ldots & \ldots \end{cases}$$

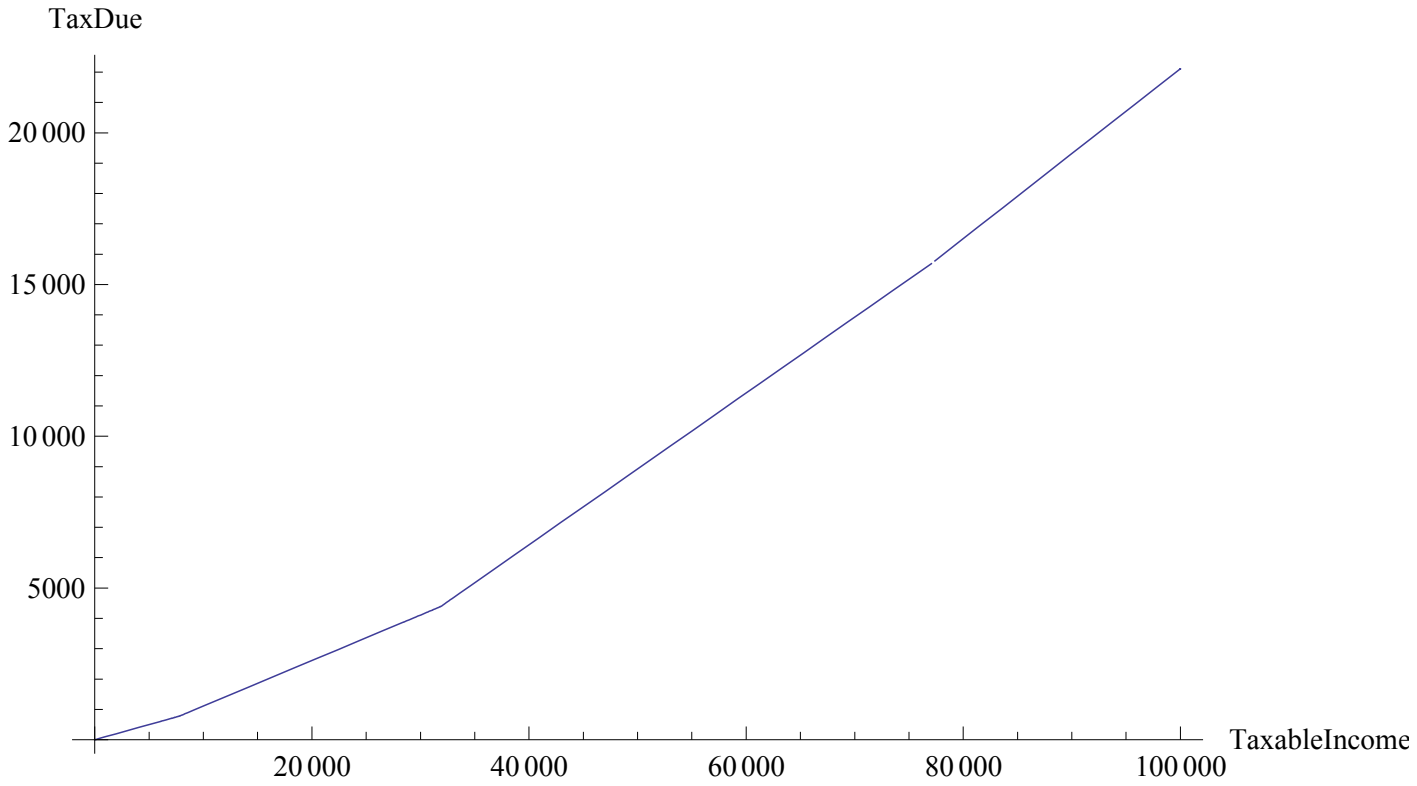
Graphical Representation of Functions



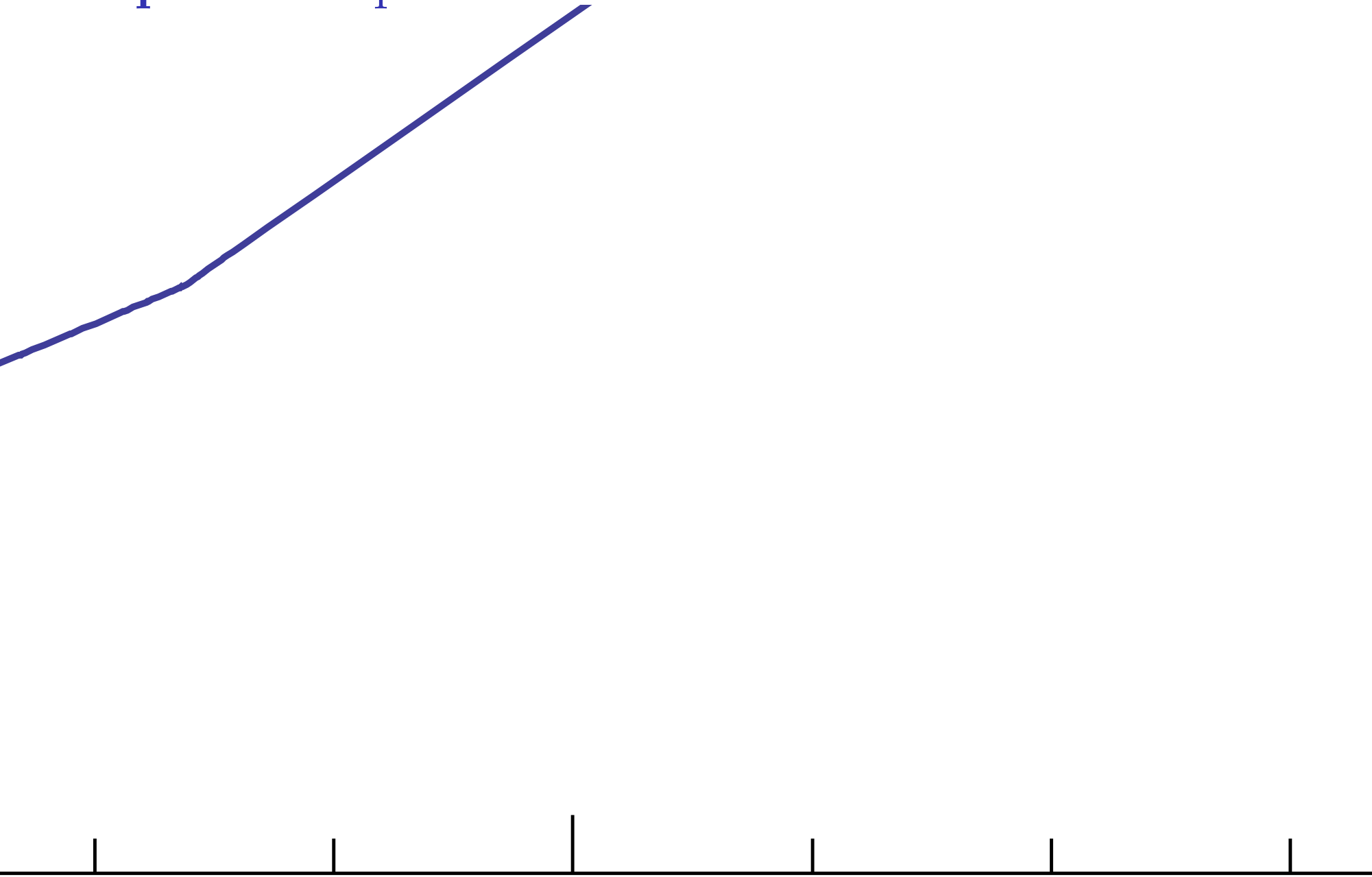
Graphical Representation of Functions



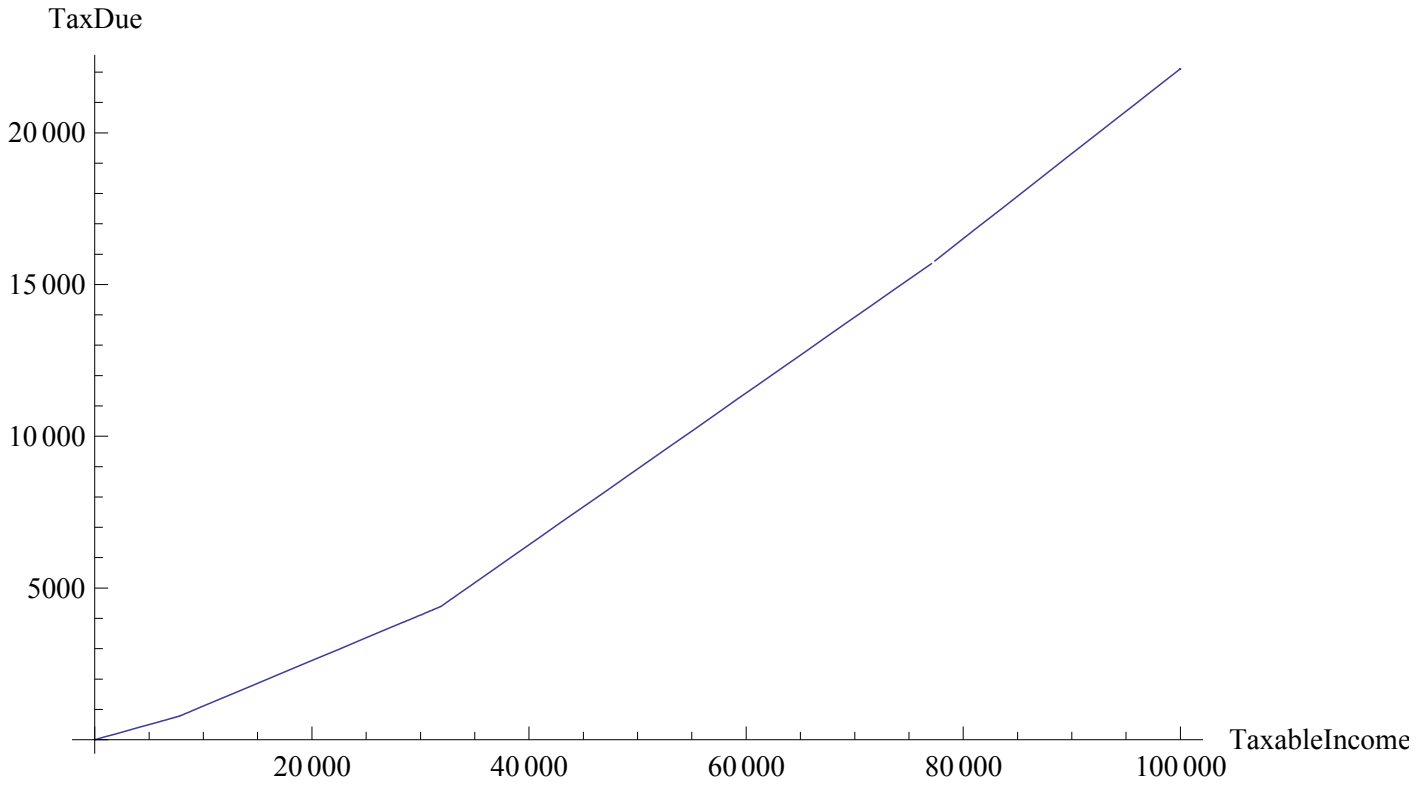
Graphical Representation of Functions



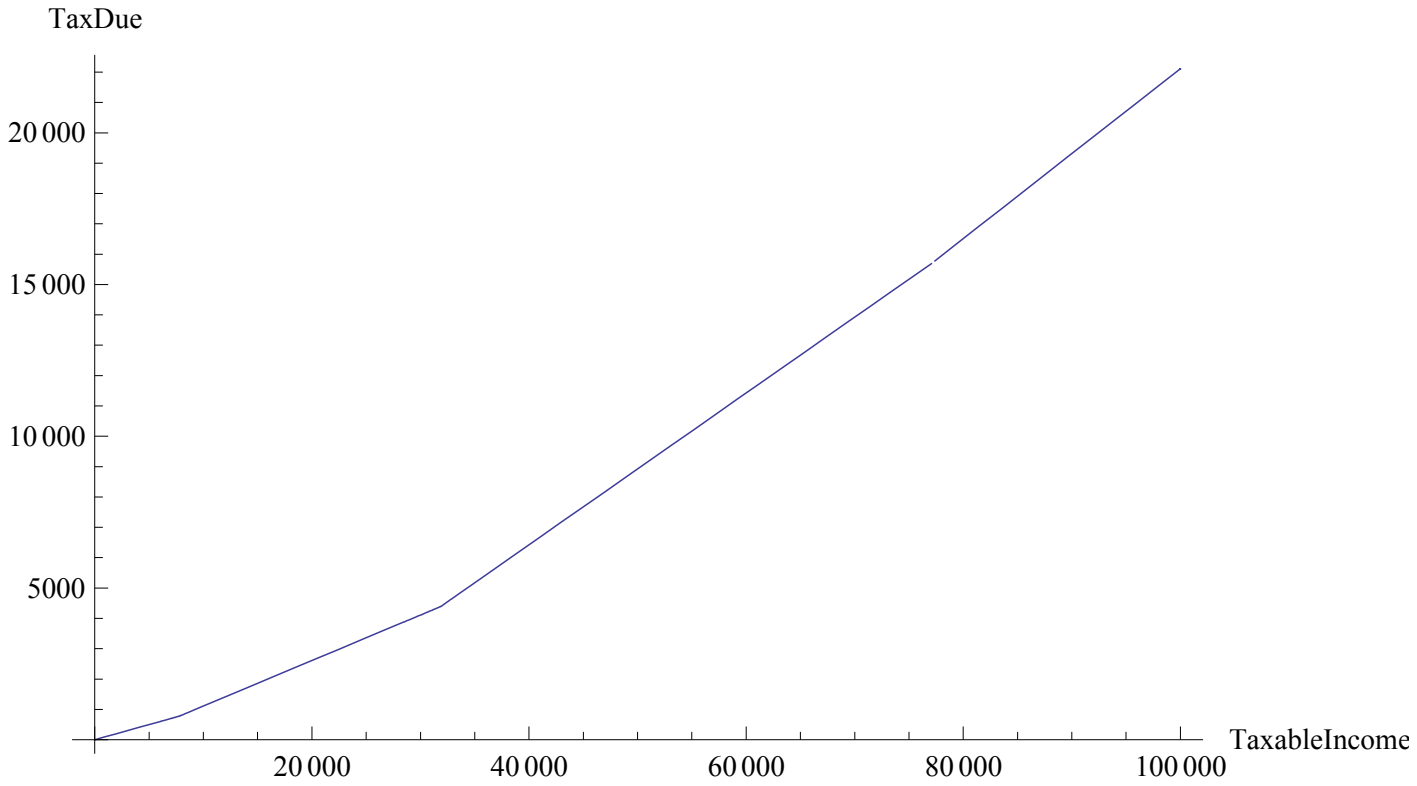
Graphical Representation of Functions



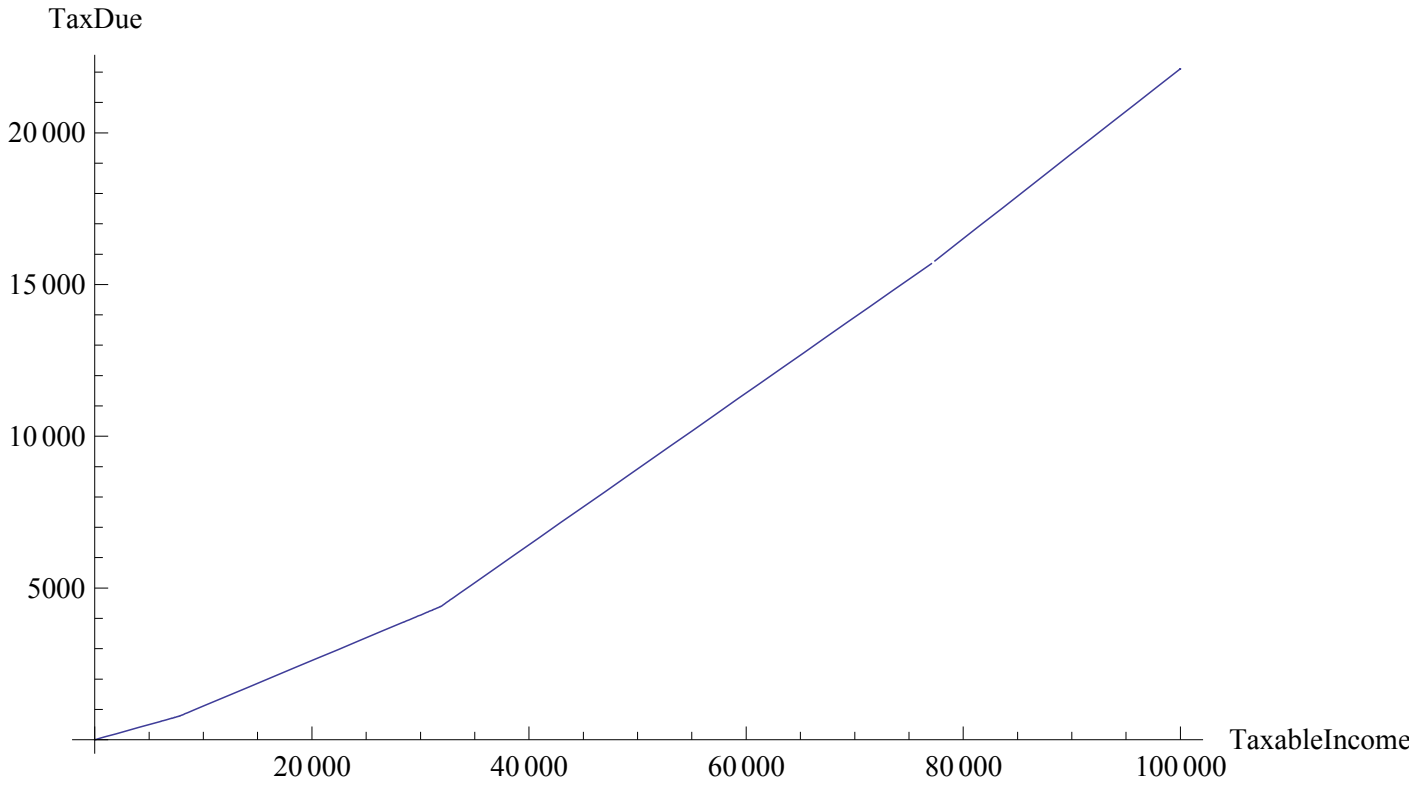
Graphical Representation of Functions



Graphical Representation of Functions

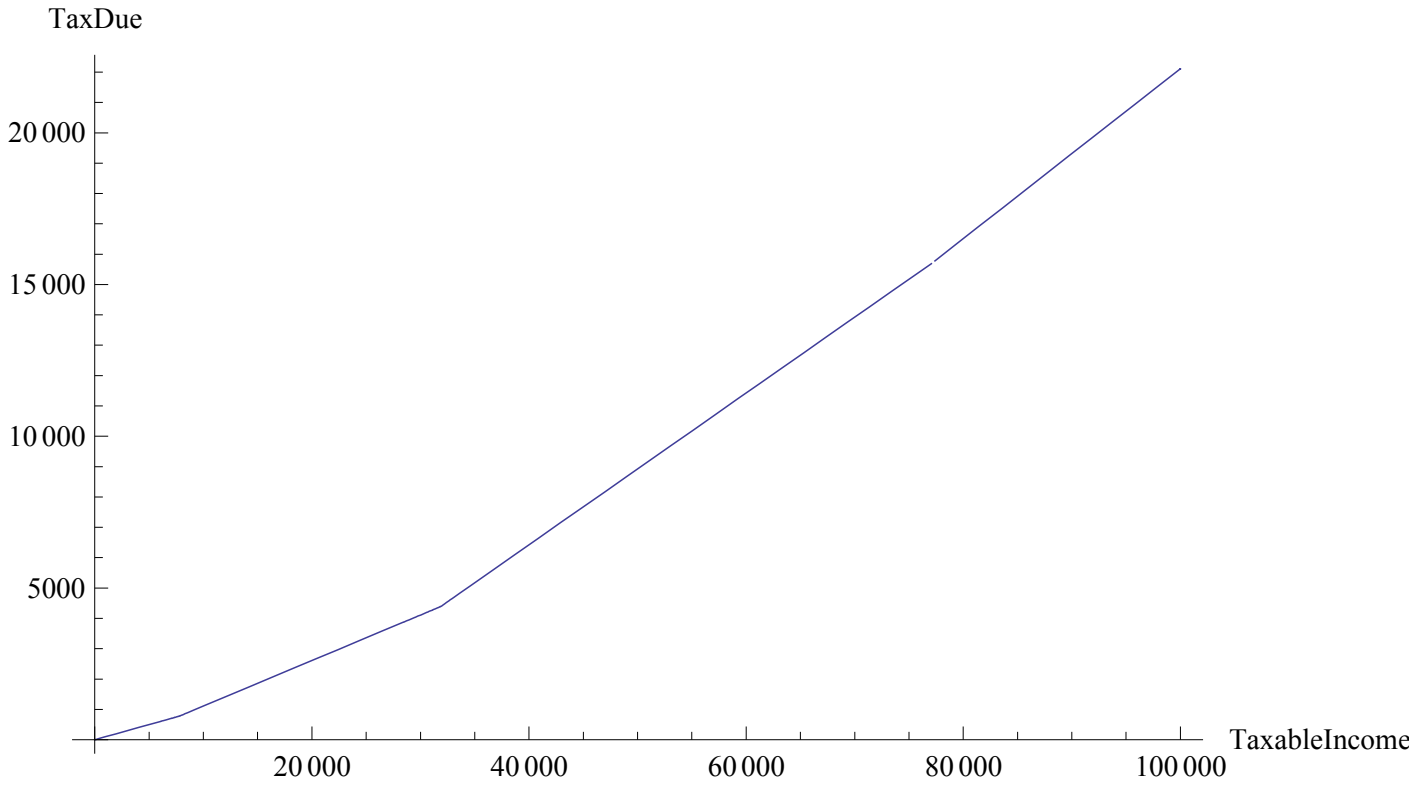


Graphical Representation of Functions



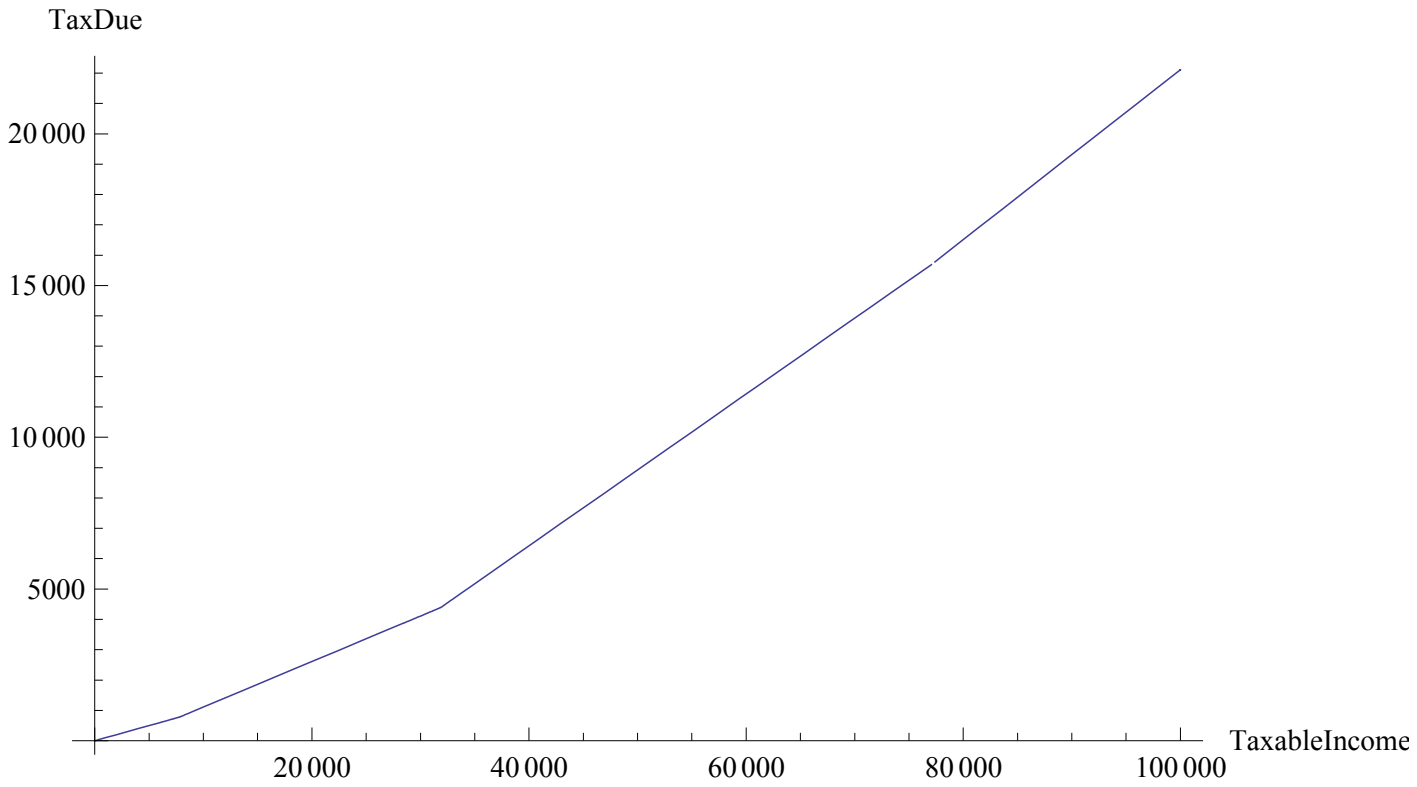
- Sequence of line segments

Graphical Representation of Functions



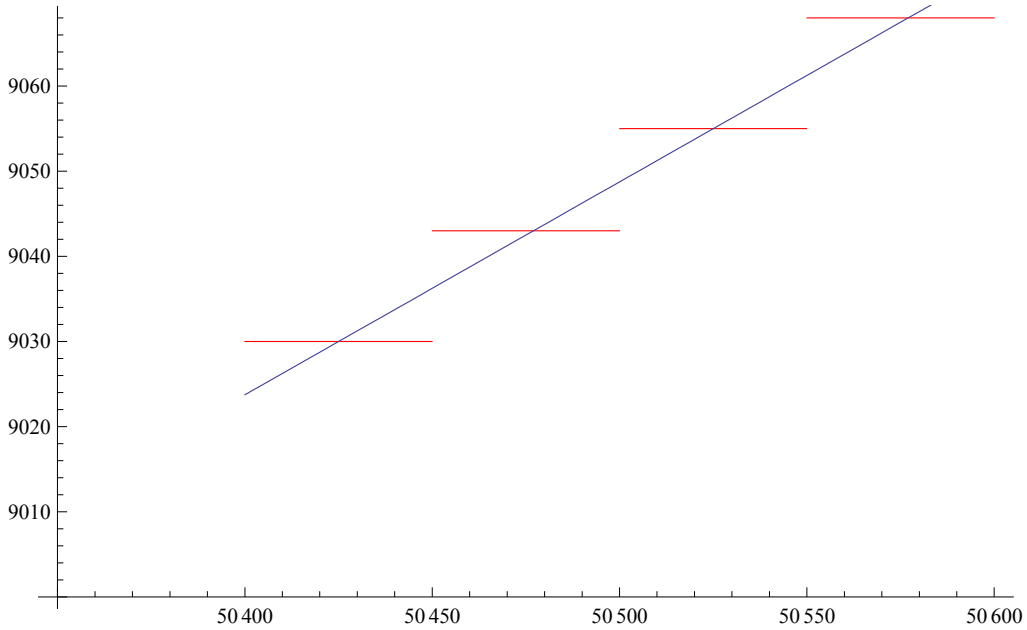
- Sequence of line segments
- Segments meet at bracket endpoints

Graphical Representation of Functions

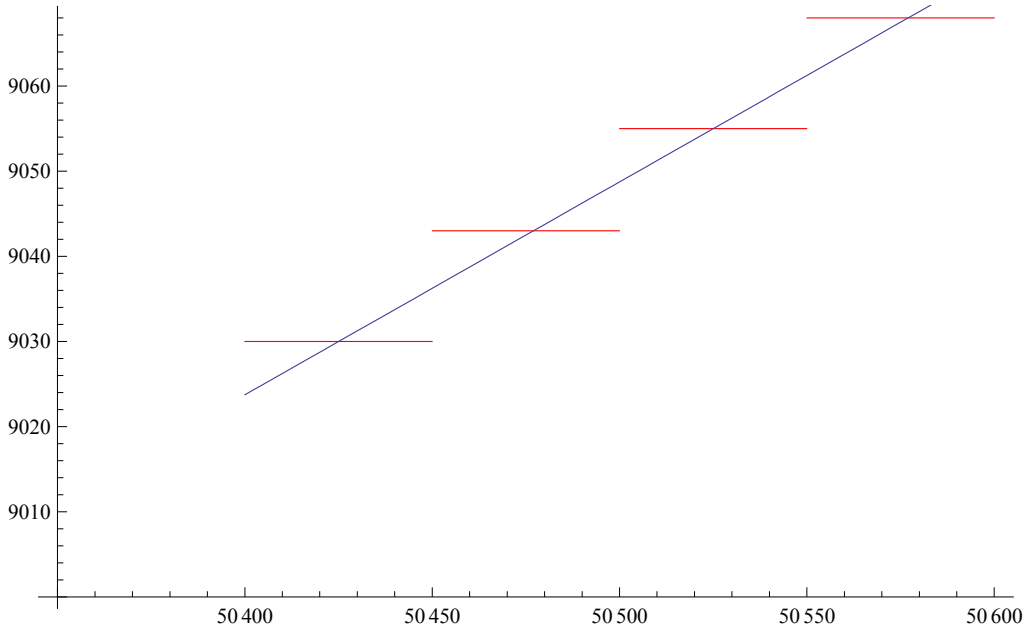


- Sequence of line segments
- Segments meet at bracket endpoints
- Slopes 10%, 15%, 25%, ...

Tax Rule vs. Tax Table

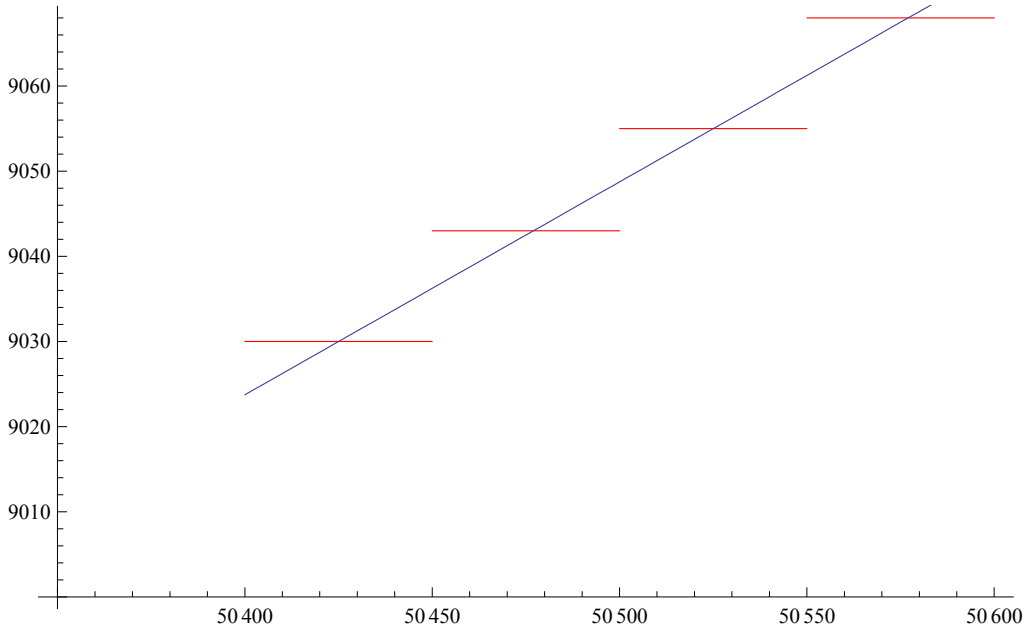


Tax Rule vs. Tax Table



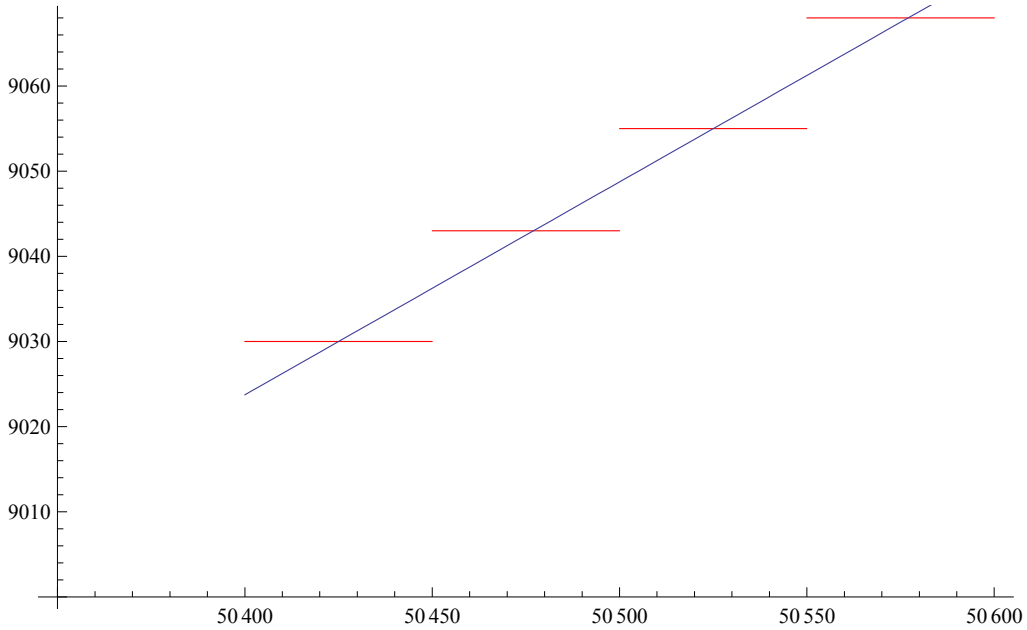
- Blue: Tax Rule

Tax Rule vs. Tax Table



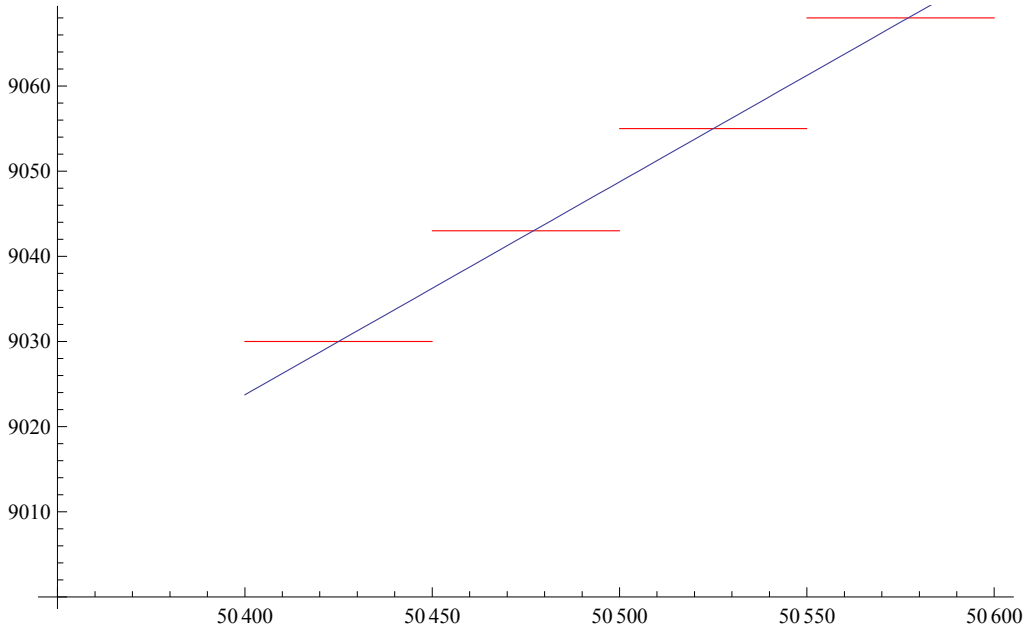
- Blue: Tax Rule
  - Increasing with a constant slope

Tax Rule vs. Tax Table



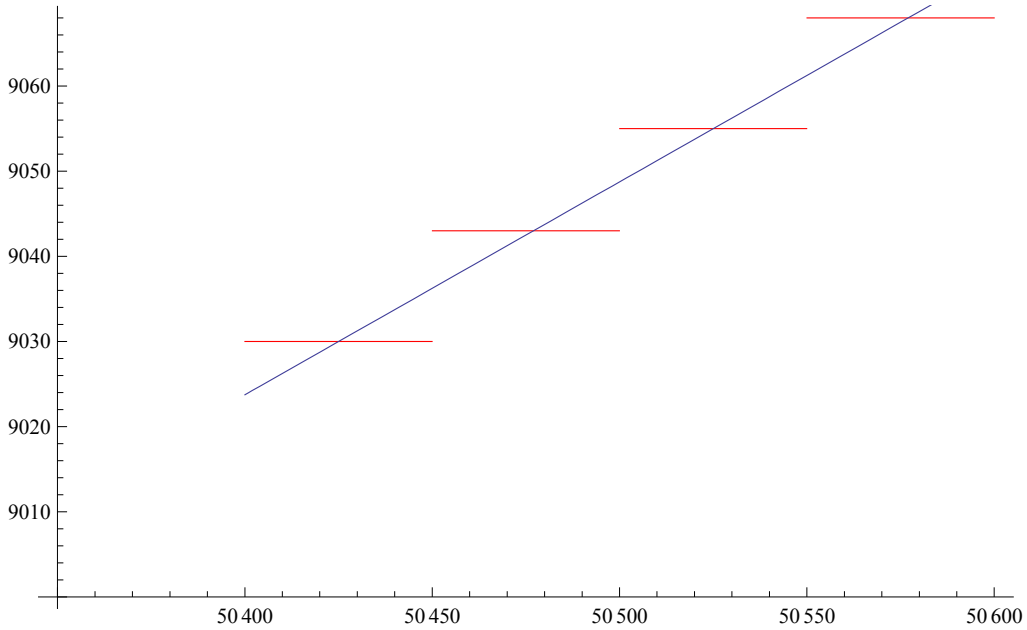
- Blue: Tax Rule
  - Increasing with a constant slope
  - Rate: 25 cents for each extra dollar (*marginal tax rate*)

Tax Rule vs. Tax Table



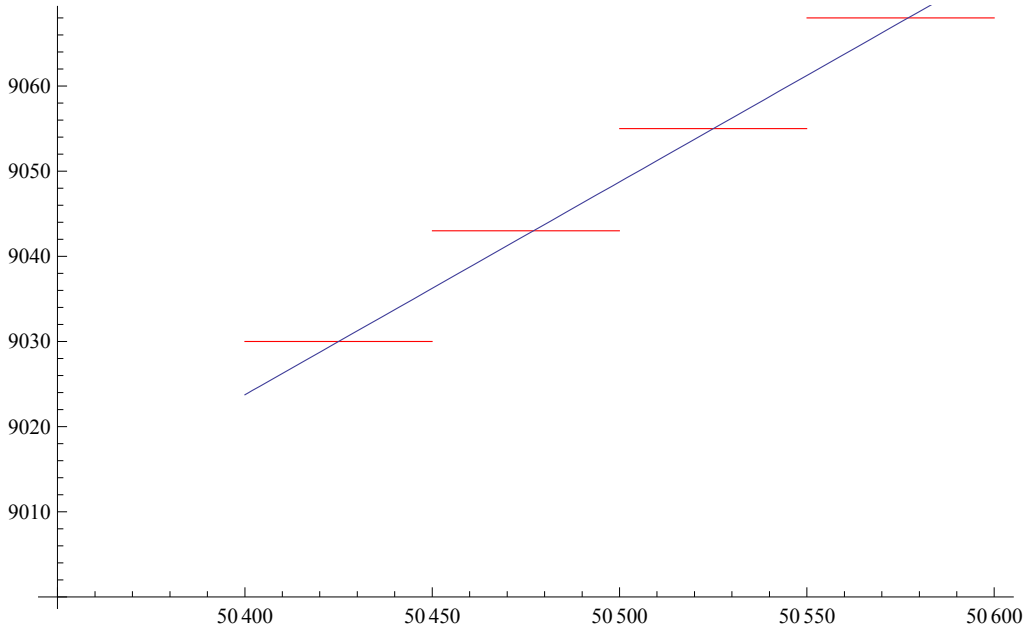
- Blue: Tax Rule
  - Increasing with a constant slope
  - Rate: 25 cents for each extra dollar (*marginal tax rate*)
- Red: Tax table

Tax Rule vs. Tax Table



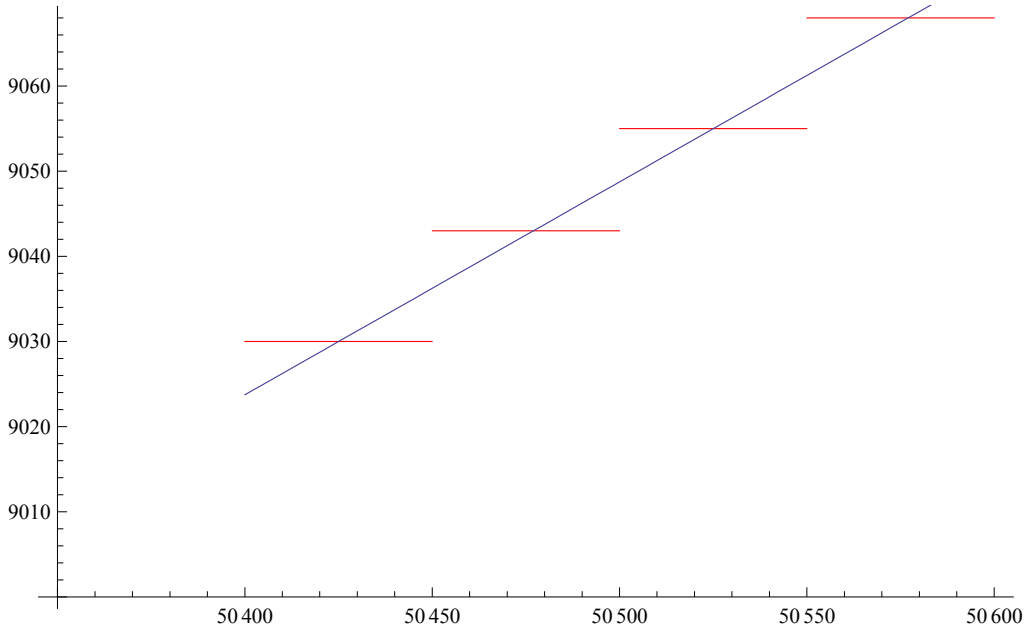
- Blue: Tax Rule
  - Increasing with a constant slope
  - Rate: 25 cents for each extra dollar (*marginal tax rate*)
- Red: Tax table
  - Constant value on small intervals (step function)

Tax Rule vs. Tax Table



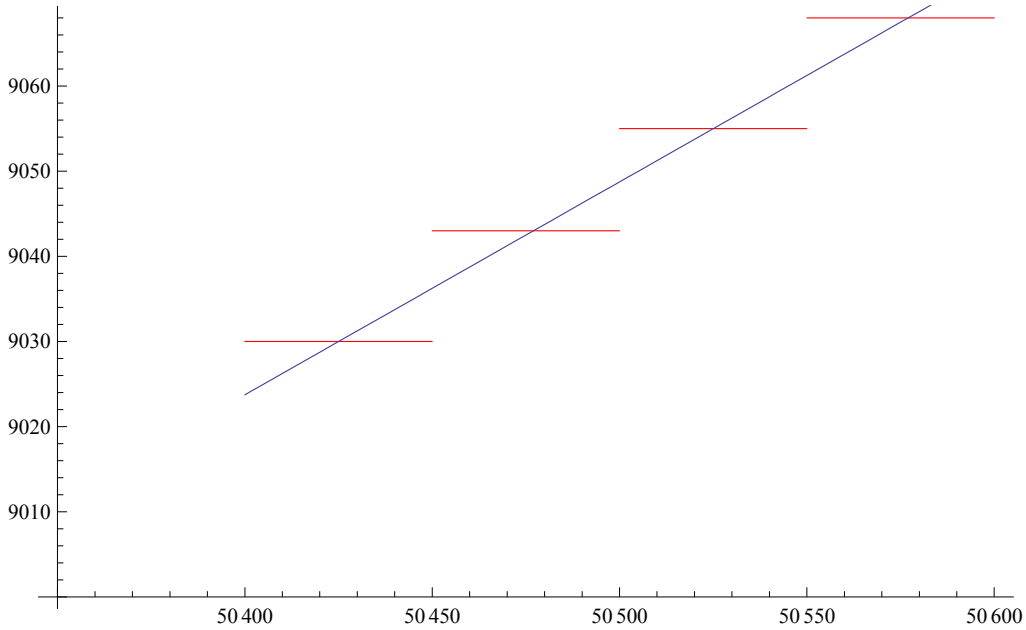
- Blue: Tax Rule
  - Increasing with a constant slope
  - Rate: 25 cents for each extra dollar (*marginal tax rate*)
- Red: Tax table
  - Constant value on small intervals (step function)
  - Value from midpoint

Tax Rule vs. Tax Table

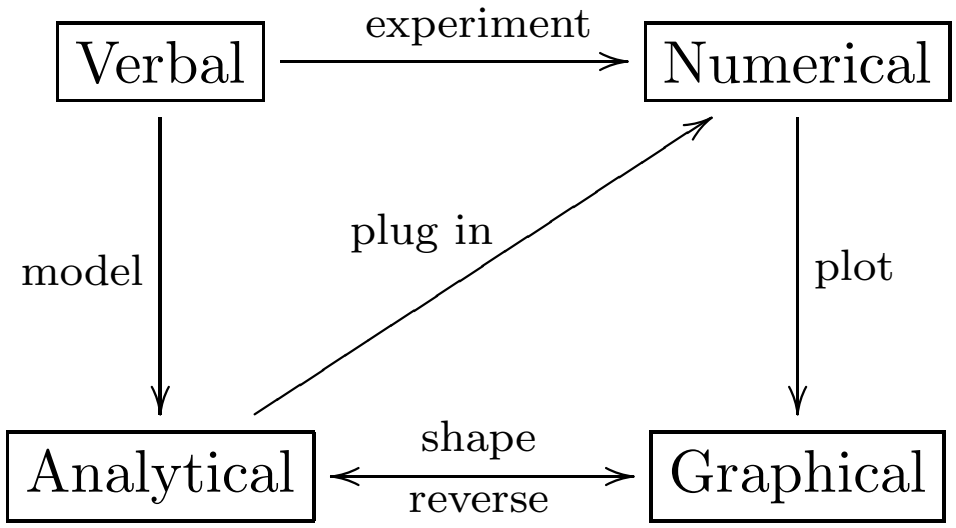


- Blue: Tax Rule
  - Increasing with a constant slope
  - Rate: 25 cents for each extra dollar (*marginal tax rate*)
- Red: Tax table
  - Constant value on small intervals (step function)
  - Value from midpoint
  - Give a little, get a little.

Tax Rule vs. Tax Table



- Blue: Tax Rule
  - Increasing with a constant slope
  - Rate: 25 cents for each extra dollar (*marginal tax rate*)
- Red: Tax table
  - Constant value on small intervals (step function)
  - Value from midpoint
  - Give a little, get a little. Really?


Verbal
experiment
Numerical
model
plug in
plot
Analytical
shape
reverse
Graphical