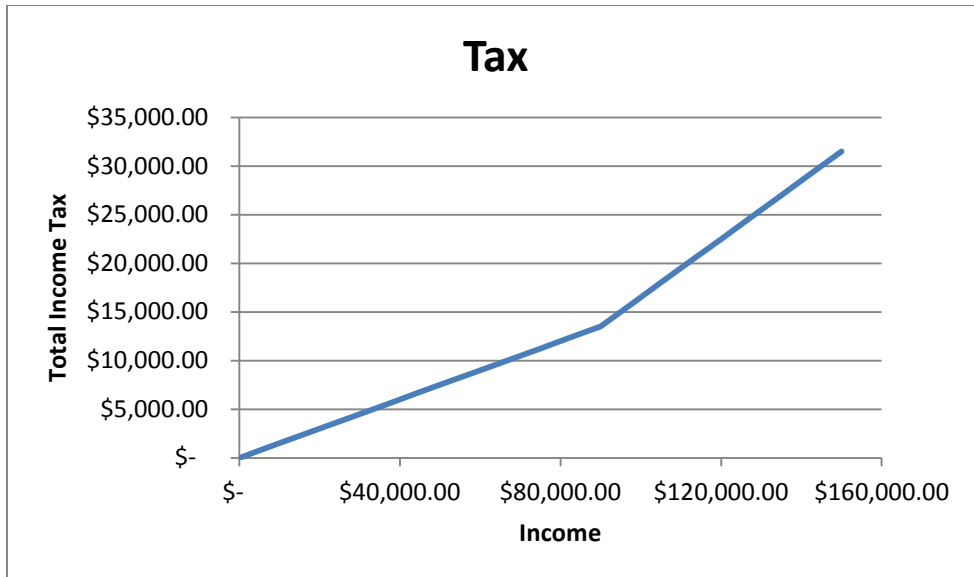


**MTH245 Homework 4**

1. *A Simplified Income Tax.* The federal income tax (as of 2014) has seven tax brackets, ranging from 10% to 39.6% of taxable income. But even if you are in a high tax bracket, not all of your income is taxed at that percent. The first \$9075 of your income would be taxed at 10%, the next interval at 15%, then 25%, etc. Let's devise a simpler plan: 15% on the first \$90,000 of taxable income and 30% on all income above \$90,000.

a. Let  $a$  denote taxable income and let  $T(a)$  be the tax on that income. Find a piecewise formula for  $T(a)$ . Be sure to define what interval of the domain each "piece" is for.

b. Use this formula to write an appropriate IF statement and create a table and graph for the function. Your final graph should look like:



2. Write a formula and create a graph for a tax function  $T(a)$  based on three tax brackets: 10% on all income up to \$40,000, then 20% on income up to \$100,000 and then 40% on all income above \$100,000.

3. A rental car company charges a flat rate of \$120 per week for a compact car, plus the following mileage charges:

- No charge if the week's mileage is 200 miles or less.
- A charge of \$0.10 per mile for each mile above 200 and less than or equal to 300.
- A charge of \$.25 per mile for each mile above 300 and less than or equal to 500.
- A charge of \$0.55 per mile for each mile above 500.

Let  $m$  be the number of miles for the week and let  $C(m)$  be the total cost for the rental car. Write a formula and create a graph.

4. Compare the following three sales jobs:

- Red Baron pays a fixed salary of \$500 per week with no commissions.
- Green Dragon pays a fixed salary of \$400 per week and also 2% commission for sales up to \$2000 and 4% commission for sales above \$2000.
- Black Adder pays entirely on commission: 8% for sales up to \$4000, and 15% commission for sales above \$4000

a. Let  $R(s)$ ,  $G(s)$ ,  $B(s)$  be the weekly compensation at the three companies based on weekly sales of  $s$  dollars. Find formulas for each of the three functions.

b. Draw one graph displaying all three functions.

c. Explain which company gives the best compensation. This will, of course, depend on the amount of sales so be sure your answer is complete.

5. Use Excel to graph the following data sets and then find the equation of the linear regression line and its  $R^2$  Value. Use the equation to answer any questions.

A. The data shows the results of a study that compared the daily average number of cigarettes in individual smoked per day to his or her death.

Daily average # of cigarettes	12	15	22	30	35	38	42	46	55	60
Average age at death	75	72	69	66	64	62	61	58	56	51

If a person smokes no cigarettes, what is the expected age at the time of death?

B. Population density is a measure of how crowded a population is. In the United States, the number of people per square mile is given. Use a base year of 0 for 1900 in your equation.

Year	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Density (people/mi <sup>2</sup> )	21.5	26.0	29.9	34.7	37.2	42.6	50.6	57.5	64.0	70.3	74.9

Predict the population density of the United States in 2020.