**Goals**

The goals of this assignment/project are:

1. to write a piece wise function based on a real situation of a US state income tax

2. to graph the piece wise function you have written using Desmos and save it for posting on Open Lab

3. to identify the range and domain in interval notation of the piece wise function

4. to determine the limits of the piece wise function that was graphed at the point the amount of tax changes due to a new income bracket

5. to communicate mathematically by writing and working collaborative with classmates to determine where the piece wise function is continuous or not and analyze to the continuity of the functions at various endpoints

**Directions**

Your group will select the name of the State from a bag containing the name of 10-12 states.

Once you have selected the state you will use the Internet to get information your state tax based on income brackets. Consider single tax filing and married filing jointly brackets.

<https://www.tax-brackets.org/newyorktaxtable>

For example, the following is the criteria for single filing for the New York State tax with income brackets:

For earnings between $0.00 and $8,500.00, you'll pay **4%**

For earnings between $8,500.00 and $11,700.00, you'll pay **4.5%** plus $340.00

For earnings between $11,700.00 and $13,900.00, you'll pay **5.25%** plus $484.00

For earnings between $13,900.00 and $21,400.00, you'll pay **5.9%** plus $599.50

For earnings between $21,400.00 and $80,650.00, you'll pay **6.33%** plus $1,042.00

For earnings between $80,650.00 and $215,400.00, you'll pay **6.57%** plus $4,792.53

For earnings between $215,400.00 and $1,077,550.00, you'll pay **6.85%** plus $13,645.60

For earnings over $1,077,550.00, you'll pay 8.82% plus **$72,702.88**

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Based on the above information,

a. Write a piece wise function f(x) for New York State tax for single tax filing and married filing jointly brackets.

b. Graph each one using Desmos.com. Save both graphs so that you can upload it on Open Lab.

c. What is the domain of the function in interval notation?

d. What is the range of the function in interval notation?

e. What is the constant interval?

f. Are there any points of discontinuity? If so where are there located?

g. Is there a maximum value? If so, what is it?

h. Is there a minimum value? If so, what is it?

i. What is the interval of decrease?

j. What is the interval of increase?

k. From other groups’ postings on Open Lab, compare and contrast the piece wise function your group graphed with one of other groups’ postings

Rubric # 1 Holistic Rubric featuring three learning outcomes,

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| --- | --- | --- | --- | --- |
|  | 4 = Advanced |  3 = Proficient |  2 = Basic | 1 = Beginning |
| The students will Solve problems related to limits and continuity. | All questions from the worksheet were answered and additional materials from the readings and class discussions were included to demonstrate the synthesis of the material. Required graphs were illustrated as not required, | More than half of the worksheet questions listed were answered, with and no additional content materials provided and the required graphs were illustrated | Less than half of the worksheet questions listed were answered with only 50 % of the required triangle illustration attached to the submission.  | Twenty five percent or less of the worksheet items were answered and no triangle illustration attached were submitted. |
| 2. Communication Skills- Students will be able to write, read, listen and speak critically and effectively about piecewise function and their limits and continuity | Written assignment is what is expected of graduate students | Written assignment is what is expected of an undergraduate students | Written assignment is what is expected of a community college students | Written assignment is what is expected of an secondary school student |
| 3. Quantitative Reasoning- Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems. | Students report displayed more than 4 problem solving strategy. | Students report displays exactly 4 problem solving strategy. | Student report displays less than 4 problem solving strategy. | Student report displays at most 2 problem solving Strategy. |

 **Maximum Points = 12**

**Rubric # 2** is an Analytical Rubric featuring the content Calculus I Content (Math 1475)

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| --- | --- | --- | --- | --- |
|  | 4 = Exceeds Expectations | 3 = Meets Expectations | 2 = Needs Improvement | 1 = Inadequate |
| Organization | Report was well organized and made sense mathematically. | Report was organized with one to two mathematical error | Report was not organized and had 2 to 3mathamatial errors | Report was not organized and contained more than3 mathematical errors |
| Accuracy of Calculations | All required limits calculations were accurate for the given data  |  2 -3 limit calculations for the given applications were inaccurate | 4 limit calculations for the given applications were inaccurate. | More than 4 2 –limit calculations for the given applications were inaccurate. |
| Accuracy of Graphs | All piecewise functions were accurately represented. Additional graphs discussed in class and from class readings were included in the report | 1 part of the piecewise function was not accurately represented. The function was missing labels for the sides and the angle measurement. | 2 -3 parts of the piecewise function were not accurately represented. The function was missing labels or they were 2 conceptual misunderstandings. | All part of the piecewise function were not accurately represented. The function was missing labels, and they were more than 2 conceptual misunderstanding of all the graphs. |
| Conceptual Understanding of limits and continuity | All limits and continuity calculations and analysis prompted by the worksheet were used appropriately throughout the report. | 1-2 limits and continuity calculations and analysis prompted by the worksheet were used appropriately throughout the report. | 3 – 4 limits and continuity calculations and analysis prompted by the worksheet were used appropriately throughout the report. | More than 4 limits and continuity calculations and analysis prompted by the worksheet were used appropriately throughout the report. |
| Grammar and Spelling | There no grammatical and spelling errors. | There are 3 grammatical and spelling errors | There are 5 grammatical and spelling errors | There are more than 5 grammatical and spelling errors. |

**Maximum points = 16**