Riemann Sums Project

Only one project is to be handed in per group. If your lab takes place on Thursday, this is due in class on Monday, September 7. If your lab takes place on Friday, this is due in class on Tuesday, September 8.

Instructions:

- You are to work on this project with the members of your lab group and no one else. Do not ask for help from other groups, or in the help room. This should be the work of only your group.
- You may ask your instructor (or any 122L instructor) questions. An easy way to do so is by asking a private question on Piazza (you can write a private note by selecting who you post to at the top).
- Only one project is to be handed in per group (and signed by all contributing members).
- All answers must be written in complete sentences. You will be graded on completeness, organization, and clarity of expression.
- Make sure to show all mathematical justification in an organized and methodical way.
- Any work done in Maple must be attached.
- Your instructor will assign your group a function and interval.

1. Fill out the following table for your given definite integral.

n	RHS	LHS	MPS	TR
5				
10				
20				
40				
80				
160				

2. Use the Student Calculus 1 package to illustrate RHS(5) in Maple. You may want to take advantage of the Maple help menu.

3. For your given definite integral, find the **smallest** Riemann sum using 5 rectangles of equal width. Show and explain your work. While you may use Maple to gain intuition, I want you to explain why you chose these particular rectangles.

4. For your given definite integral, find the **largest** Riemann sum using 5 rectangles of equal width. Show and explain your work. While you may use Maple to gain intuition, I want you to explain why you chose these particular rectangles.

5. In lab, we defined the trapezoid rule with n rectangles to be $\text{TR}(n)=\frac{1}{2}\left(\text{LHS}(n)+\text{RHS}(n)\right)$. Explain, using complete sentences, why this is called the *trapezoid* rule.

6. Create a challenging exam question that tests the knowledge learned in this lab. Provide a full solution. When construction your question, recall that exams in this course are taken without the use of a calculator or Maple.

7. This question pertains to the table on the next page. Assume $f(x)$ is continuous and positive for all x in $[a,b]$. If the conditions in a particular column hold for all x in $[a,b]$, decide whether the sum in a particular row overestimates $\int_a^b f(x)\,dx$ or underestimates $\int_a^b f(x)\,dx$, or whether there is not enough information to tell. Explain all of your answers.

	$f'(x)>0,\ f''(x)>0$	$f'(x)>0,\ f''(x)<0$	$f'(x)<0,\ f''(x)>0$	$f'(x)<0,\ f''(x)<0$
RHS				
LHS				
TR				
MPS				

8. Suppose a train engineer spots an object on the track 350 feet ahead. She immediately applies the brakes, causing the train to slow to a stop. The table below gives the velocity of the train t seconds after the brakes are applied.

Time since start (sec)	0	2	4	6	8	10
Speed (ft/sec)	85	75	60	40	12	0

Does the train hit the object? Answer *yes*, *no*, or *not enough information*. Make sure to explain your reasoning.