Written Homework

Your carefully written solutions to the following questions will be due at the beginning of class on **Monday, September 29**.

1. Let \( f(x) = \cos x \).
   (a) Draw a careful graph of \( y = f(x) \) on the interval \( 0 \leq x \leq \pi \); then shade the region that is under the graph and above the x-axis.
   (b) Divide the interval \( 0 \leq x \leq \frac{\pi}{2} \) into three equal subintervals. Write down expressions for each of these intervals.
   (c) Estimate the area of the shaded region by writing down a Riemann Sum using three subintervals and left endpoints as sample points. Evaluate the sum exactly and give a decimal approximation.
   (d) Is the estimate in part (c) an underestimate or an overestimate? Explain your answer. (You may use a picture to help you illustrate your reasoning, but your answer should be in complete sentences.)
   (e) Repeat part (c) using right endpoints as sample points instead. Does this give an underestimate or an overestimate? Explain.

2. Let \( f(x) = \sqrt{x} \).
   (a) Draw a graph of the function \( f(x) \) for \( 0 \leq x \leq 2 \) and shade the area under the graph and above the x-axis for \( 0 \leq x \leq 1 \).
   (b) Estimate the area of the shaded region using a Riemann Sum with 5 rectangles and using right endpoints as sample points. Give a decimal approximation for your answer.
   (c) Use sigma notation to write down a Riemann Sum corresponding to using \( n \) rectangles and right endpoints as sample points. **Do not try to evaluate this Riemann Sum in any way.**

3. Let \( f(x) = 3x^2 \).
   (a) Use sigma notation to write down a Riemann Sum for the area under the graph of \( f(x) \) and above the x-axis for \( 0 \leq x \leq 2 \).
   (b) Simplify the Riemann Sum from part (a) using one of the formulas from p. 357 of the Stewart textbook. (When you finish simplifying, there should still be n’s left in your expression, but no other variables and no \( \sum \) symbols.)
   (c) Calculate the limit of your answer in part (b) as \( n \) goes to infinity. (This will give you the area under the graph.)

   **Comment:** You can check your answer to question 3(c) using the Evaluation Theorem, but you must calculate the answer using a limit of Riemann Sums to get credit for this question.
Daily Practice Problems

You should do the suggested reading below and attempt these exercises after class each day. You will not submit solutions to these questions for grading, but you may use them as notes during the weekly quizzes on Fridays.

After class on **Tuesday, September 23**, read Section 5.1 and work the following exercises:
Section 5.1, # 1, 3, 5

After class on **Wednesday, September 24**, read Section 5.1 and work the following exercises:
Section 5.2, # 1, 3, 23, 25

After class on **Thursday, September 25**, read Section 5.2 (upto page 361) and work the following exercises:
Section 5.2, # 41, 43, 45, 49

After class on **Friday, September 26**, reading Section 5.3 (upto page 370) and work the following exercises:
Section 5.3, # 3, 7, 13, 21