

Homework 4
Due Tuesday, February 5th

Instructions: write up solutions to all problems below. Neatness counts: be sure to follow guidelines for homework in the syllabus.

Reading Assignment: Chapter 4.6. Chapter 4.7, but skip sections 4.7.3 and 4.7.4, and examples that involve the “comparison test.” We won’t cover this in this class.

1. For the following functions and intervals, compute two Riemann sums: one with three subdivisions, and one with five subdivisions. In each case, also state which integral the Riemann sum is approximating.
 - (a) $f(x) = \sin(x)$, interval $[0, \pi]$.
 - (b) $g(x) = \ln(x)$, interval $[\frac{1}{e}, e]$.
 - (c) $R(t) = 2 + 4t$, interval $[-1, 1]$.
2. Find the area between the graph of $f(x)$ and the x -axis between the following values. Also, draw the graph and shade in the area being computed.
 - (a) $f(x) = \cos(x)$, $x = -\pi/2$ to $x = \pi$.
 - (b) $g(t) = xe^{2x}$, $x = 0$ to $x = 3$.
 - (c) $R(s) = x^2 - x^4$, $x = 0$ to $x = 1$.
3. Chapter 4.5, (a) # 30, (b) # 32.
4. (This is basically problem 39 in chapter 4.6, but with less awful numbers.) Several very skinny 3 m long snakes are collected in the Amazon. Each has a density of $\rho(x)$ given by

$$\rho(x) = \frac{1}{14}(x-1)^2 - \frac{1}{14}x.$$

Here, $\rho(x)$ is measured in g/cm, and x in cm from the tip of the tail.

- (a) Find the minimum and maximum density of the snake. Where does the maximum occur on the snake?
 - (b) Find the total mass of the snake.
 - (c) Find the average density of the snake. How does this compare with the maximum and minimum density? [Average density is the total mass divided by the length of the snake.]
 - (d) Graph the density function and the average.
5. Extra credit, 3 points: Chapter 4.6, # 42. [This is a hard problem. Also, the solution in the book for # 41 is very confusing, so I do not recommend using it as a guideline.]