Practice Examples for Lab: Set 7

- 1

A more accurate estimate of the area under the curve is to use trapeziums rather than rectangles. Thus the area under a curve $f(u)$ in the interval $[p, q]$ will be approximated by the area of the trapezium with corners $(p, 0)$, $(p, f(p))$, $(q, f(q))$, $(q, 0)$. This area is simply $(f(p) + f(q))(q - p)/2$. Use this to compute the natural logarithm.

- 2

Write a program to find $\arcsin(x)$ given x.

- 3

Write a program that takes as input a natural number x and returns the smallest palindrome larger than x.

- 4

Add checks to the GCD code to ensure that the numbers typed in by the user are positive. For each input value you should prompt the user until she gives a positive value.

Practice Examples for Lab: Set 7

- 5

Simpson's rule gives the following approximation of the area under the curve of a function f:

$$\int_a^b f(x)dx \approx \frac{b-a}{6}\left(f(a)+4f\left(\frac{a+b}{2}\right)+f(b)\right)$$

Use this rule for each strip to get another way to find the natural log.

- 6

Children often play a guessing game as follows. One child, Kashinath, picks a number between 1 and 1000 which he does not disclose to another child, Ashalata. Ashalata asks questions of the form "Is you number between x and y?" where she can pick x, y as she wants. Ashalata's goal is to ask as few questions as possible and determine the number that Kashinath picked. Show that Ashalata can guess the number correctly using at most 10 questions. Hint: Use ideas from the bisection method.