Math 31L Lab Quiz #3

Blake, Fall 2000

Name: ____________________________

1. (8 points) Suppose $f(x) = 3x + 1$. Consider the following sequence of sums for the function f over the interval [0,5]:

$$\sum_{k=1}^{10{,}000}\left(3(k\tfrac{5}{10{,}000})+1\right)\tfrac{5}{10{,}000}\ , \quad \sum_{k=1}^{20{,}000}\left(3(k\tfrac{5}{20{,}000})+1\right)\tfrac{5}{20{,}000}\ , \quad \sum_{k=1}^{30{,}000}\left(3(k\tfrac{5}{30{,}000})+1\right)\tfrac{5}{30{,}000}\ ,$$

$$\sum_{k=1}^{40{,}000}\left(3(k\tfrac{5}{40{,}000})+1\right)\tfrac{5}{40{,}000}\ , \quad \sum_{k=1}^{50{,}000}\left(3(k\tfrac{5}{50{,}000})+1\right)\tfrac{5}{50{,}000} \qquad , \ldots$$

(a) Is this sequence of sums increasing or decreasing or neither? You must justify your answer.

(b) Give the precise numerical value which the sequence of sums above is approaching. Be sure to make it clear how you arrive at your number.

2. (8 points) Let $f(x) = 10 - x$. Suppose we use RHSs and LHSs to approximate $\int_1^7 f(x)\,dx$.

(a) Which number below is the smallest number which is greater than or equal to every LHS (i.e., for all choices of the number, n, of subintervals)? [Circle one answer.]

54 18 63 70 36 6 9

(b) Which number below is the smallest number which is greater than or equal to every RHS (i.e., for all choices of the number, n, of subintervals)? [Circle one answer.]

54 18 63 70 36 6 9

(over)

3. (18 points) In this problem we consider sums which approximate the integral $\int_1^3 \sqrt{5+x^4}\,dx$.

(a) Among the sums below you will find a LHS, a RHS, and an MS (midpoint sum). Circle and label each of these three sums.

$$\sum_{k=1}^{5000} \sqrt{5+(.002k)^4}\,(.002) \qquad \sum_{k=0}^{4999} \sqrt{5+(1+.002k)^4}\,(.002) \qquad \sum_{k=1}^{1000} \sqrt{5+(1+.002k)^4}\,(.002)$$

$$\sum_{k=1}^{1000} \sqrt{5+(1+.001k)^4}\,(.001) \qquad \sum_{k=0}^{2499} \sqrt{5+(1+.0008k)^4}\,(.0008) \qquad \sum_{k=0}^{2500} \sqrt{5+(1+.0008k)^4}\,(.0008)$$

$$\sum_{k=0}^{999} \sqrt{5+(1.001+.001k)^4}\,(.002) \qquad \sum_{k=0}^{999} \sqrt{5+(1.001+.002k)^4}\,(.002) \qquad \sum_{k=1}^{2500} \sqrt{5+x^4}\,(.0008)$$

(b) Fill in the missing parts of the sum below so that you create a valid Riemann sum which approximates the integral, but such that it is **not** a LHS, or a RHS, or a Midpoint Sum.

$$\sum_{k=0}^{499} \sqrt{5+\left(\rule{4cm}{0.4pt}\right)^4}\,\left(\rule{1.5cm}{0.4pt}\right)$$