

Math 201 - Program #3

March 29, 2011

Name _____

Write, compile, and test a C++ program that calculates a Riemann sum for the continuous function $y = f(x)$ on the interval $[a, b]$. The work-horse for your program should be a function named `riemann` with a function header line similar to

```
double riemann( double (*f)( double x ), double a, double b, int n,
short iflag )
```

This function should be called by using the syntax `riemann(f, a, b, n, iflag)`, where

- `f` is the name you have given to the C++ function defining $f(x)$;
- `a` and `b` define the closed and bounded interval over which you are computing the Riemann sum;
- `n` is the number of subintervals in your partition of $[a, b]$;
- `iflag` is a flag that indicates whether left endpoints, right endpoints, or midpoints of subintervals will be used in computing the Riemann sum; and
- the return value is the value of the Riemann sum.

The arguments `n` and `iflag` should be optional, with appropriate default values. You should use a fixed-count loop with an integer counter in your `riemann` function.

The main function need not request any user input (but it may if this is your preference). The main function should output the Riemann sum, appropriately formatted, and a message stating the number of subintervals used and which points were used in computing the sum (i.e right, left, mid-).

The following examples are given to help you test your program:

1. The Riemann sum for $f(x) = 160 - 9.8x$ on $[0, 3]$ using 48 subintervals and right endpoints is 434.98. Using left endpoints, it is 436.82.
2. The Riemann sum for $y = \sin x$ on $[0, \pi/2]$ using 100 subintervals and right endpoints is 1.00783.