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Riemann and Randomized Integrators

**Overview**:

For this assignment you will make **two** programs for computing integrals- one that implements Riemann integration, and a second that implements Monte Carlo integration, as discussed in class.

**Major Implementation/Design Issues:**

One problem I faced in designing both programs was creating a findY method that takes in an x value and returns the y value. While it ended up being only a few lines in each program, many problems kept arising as I designed the method. When I got it working properly, I felt like a big issue had been solved.

In the RiemannIntegrator program, a known issue is that in my findArea method I increment by the number of rectangles to be added, which, as stated in class, limits the scope of the program, as the number of rectangles is restricted to being doubled a mere 31 times. This is not an issue in small polynomial functions, but becomes more apparent when large exponents are introduced and integrated across broad ranges of x values.

In RandomizedIntegrator, most of my time was spent figuring out where to place the top and bottom of the rectangle so it would fully enclose the curve. Once that was set, the throwing of darts and calculating the number inside the curve was similar to the PiEstimator, and was not too much of a difficulty for me.

**Known Problems:**

As stated above, my RiemannIntegrator increments based on the number of rectangles, which inherently limits the program as the number of rectangles may only be doubled a maximum of 31 times. Large polynomials with exponents greater than 15 cause the program to miscalculate the area.

The problems with RandomizedIntegrator are ones that are inherent to the nature of randomization solvers. The run time is slightly longer than I would want it to be, but I chose a number of darts that seemed like enough without choosing so many that the run time goes through the roof. The nature of randomization is that the answer will never be exactly what I wish it to be, but mine is close enough for the time being.