Wednesday, January 24

Class 1:

Estimating Area: Subdivide, Approximate, Accumulate, Refine

The focus of this second course in Calculus is *integration*. We begin with two problems in geometry that we will eventually be able to solve as "integrals." For now, using geometry you will be able to obtain over- and underestimates of these solutions. These estimation techniques will give you some of the key ideas underlying the integral.

Preparing for Class 2

Reading: *H-H* Section 3.1

Problems: *H-H* p.152 #7, 9. Also solve the Problems on the reverse of this assignment sheet.

Friday, January 26

Class 2:

Estimating Net Distance Travelled, Given Velocity

We consider another problem today whose solution we will soon be able to write as an integral – determining the net distance travelled by an object, given its velocity. Graphing the velocity function determines a region in the plane between this graph and the horizontal (independent variable) axis. The area of this region can be interpreted as the net distance travelled, and techniques similar to those from the first class can be used to estimate this area. The new idea here is that this area is determined by a *function graph*.

Preparing for Class 3

Reading: Review *H-H*, Section 3.1; begin reading Section 3.2.

Problems: *H-H*, p.151-152: #1, 2, 5, 10

Monday, January 29

Class 3:

Riemann Sums and Error Estimates

The graph of a function f over an interval $[a, b]$ determines a region of the coordinate plane between that graph and the horizontal (independent variable) axis. In most commonly encountered cases, this region will have a well-defined area, which we will soon identify as the *definite integral of f over the interval $[a, b]$*. (Regions below the axis will have a *negative* area, while those above it will have a *positive* area; the integral will give the *net* area.) *Riemann sums* can be used to estimate such areas. In case the function is either monotonic increasing or monotonic decreasing, we can use "error stacks" based on Riemann sums to readily determine the difference between over- and underestimates of the area.

Required Week 1 Homework Due: Hand in homework preparing for Classes 2 and 3.

Additional Problems Preparing for Class 2

Problem 1

Sketch a graph of the function $y = f(x) = x^2$ over the interval $0 \leq x \leq 2$. Estimate the *length* of this graph. Then improve your estimate. Explain your method.

Problem 2

The energy consumed by an electrical appliance is generally measured in *kilowatt-hours*. For example, a 1500-watt (1.5 kilowatt) space heater left on for two hours consumes 3 kilowatt-hours of energy during that time. Now suppose a space heater has three power demand settings: 500 watts, 1000 watts, and 1500 watts. The heater is set to 1000 watts from 6 to 8 pm, then switched to 1500 watts from 8 to 11 pm, then switched to 500 watts from 11 pm until 8 am the next morning. Graph the power demand function for the space heater over the course of this night and determine the total energy (in kilowatt-hours) it consumed.