Daily Announcements & Reminders:

Goals for Today: Sections 15.2, 15.3

- Be able to set up & evaluate a double integral over a general region
- Change the order of integration for general regions
- Compute areas of general regions in the plane
- Compute the average value of a function of two variables

Example 78. Write the two iterated integrals for $\iint_R 1 \, dA$ for the region R which is bounded by $y = \sqrt{x}, y = 0$, and $x = 9$.

Example 79. Set up an iterated integral to evaluate the double integral $\iint_R 6x^2 y \, dA$, where R is the region bounded by $x = 0, x = 1, y = 2$, and $y = x$.

Example 80. Sketch the region of integration for the integral

$$\int_0^1 \int_{4x}^4 f(x,y)\ dy\ dx.$$

Then write an equivalent iterated integral in the order $dx\ dy$.

Area & Average Value

Two other applications of double integrals are computing the area of a region in the plane and finding the average value of a function over some domain.

Area: If R is a region bounded by smooth curves, then

$$\text{Area}(R) = \_\_\_\_\_$$

Example 81. Find the area of the region R bounded by $y = \sqrt{x}, y = 0$, and $x = 9$.

Average Value: The average value of $f(x, y)$ on a region R contained in $\mathbb{R}^2$ is

$$f_{avg} = \_\_\_\_\_$$

Example 82. Find the average temperature on the region R in the previous example if the temperature at each point is given by $T(x, y) = 4xy^2$.