MA205 - Integral Calculus
Lesson 23: Rectangular Regions I

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1. Compute $\int\int_R f(x,y)\,dA$ if $f(x,y) = \sqrt{x} + y$ and $R = [0,2] \times [1,4]$.

2. Compute $\int_0^3 \int_0^4 (2x + 3x^2 y)\,dy\,dx$

3. Compute $\int_1^3 \int_1^2 \left(x^3 y^2 + \dfrac{x}{y}\right)\,dx\,dy$

4. Switch the order of integration in Problem 3 above and compute the double integral again. Make sure your two answers match.

5. Use your answers to Problems 3 and 4 above to find the *average value* of $f(x,y) = x^3 y^2 + \frac{x}{y}$ over the rectangle $R = [1,2] \times [1,3]$.

6. The population density of College Station, TX (that's right, home of Texas A&M!) is given by the function $P(x, y) = 5000e^{-0.13x^2-0.13y^2}$ (measured in people per square mile). If the origin $(0, 0)$ denotes the center of the city, what is the *total* population in the city's 40 square miles, which measure 2 miles east and west of the center and 5 miles north and south of the center? What is the *average* population per square mile?