HW 6
Math 261

Please see the course syllabus for details on how to turn in your homework assignments.

1. (5 pts.) TRUE OR FALSE:
   (a) Let R denote a region in the xy-plane. The expression $\int_R dxdy$ computes the area of R.
   (b) Let R denote a region in the xy-plane, and $f(x,y)$ a function from $\mathbb{R}^2$ to $\mathbb{R}$. The expression $\int_R f(x,y)dxdy$ is always positive.
   (c) Let R denote a region in the xy-plane, and $f(x,y)$ a function from $\mathbb{R}^2$ to $\mathbb{R}$ such that $f(x,y)$ is non-negative for any point in R. The expression $\int_R f(x,y)dxdy$ computes the volume under the graph of f (and bounded below by the xy-plane).
   (d) $\int_2^4 \int_3^7 dxdy = \int_2^4 \int_3^7 dydx$.
   (e) $\int_2^4 \int_3^7 f(x,y)dxdy = \int_2^4 \int_3^7 f(x,y)dydx$ for any function $f(x,y)$.
2. (3 pts.) Suppose we wish to integrate $f(x,y) = 3x^2 - xy + 3$ over the rectangle given by $0 \le x \le 2$, $1 \le y \le 5$. Set up this integral using the variable order $dxdy$ but do not compute the answer.
3. (3 pts.) Now compute the answer to the previous problem.
4. (3 pts.) Repeat problem 2 using variable order $dydx$ and compute the answer.
5. (3 pts.) Suppose we wish to integrate some function $g(x,y)$ over the triangle with vertices $(0,0)$, $(0,2)$, and $(1,2)$. Set up this integral using the variable order $dxdy$. (Do not compute the answer.)
6. (3 pts.) Compute the volume of the octahedron in $\mathbb{R}^3$ with vertices at $(0,0,\pm1)$, $(0,\pm1,0)$, $(\pm1,0,0)$. (Hint: exploit the symmetries of the problem to reduce to a problem that may be computed as a simple double integral).