**Advanced Calculus 425, Homework 3.**

**Due Thursday Feb 13, in class.**

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**3.0.** Read the the notes: Chapters 0 and 5 again.

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## Volume of a pyramid

Define the *right-angular pyramid* $P_n$ in $\mathbb{R}^n$ as the set of all points $x = (x_1, ..., x_n)$ in $\mathbb{R}^n$, such that $x_1 \geq 0,\ x_2 \geq 0,\ \cdots x_n \geq 0$ and $x_1 + x_2 + \cdots + x_n \leq 1$. We will eventually calculate the $n$-dimensional volume $Vol^n(P_n)$ of this pyramid.

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**3.1.** (a) Draw $P_1$ in $\mathbb{R}^1 = \mathbb{R}$, explain why this is the interval $[0, 1]$. Find the length of this interval as $\int_{P_1} 1\ dx_1$.

(b) Draw $P_2$ in $\mathbb{R}^2$, explain why this is a triangle and what are its vertices. Find the are of this triangle as $\int_{P_2} 1\ dx_1\ dx_2$ (compute it by iterated integrals).

**3.2.** Draw $P_3$ in $\mathbb{R}^3$, explain why this is the pyramid and what are its vertices. Find the volume of this pyramid as $\int_{P_3} 1\ dx_1\ dx_2\ dx_3$ (compute it by iterated integrals).

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## Volumes of solids

**3.3.** Do the problems

- section 5.5, problems 2, 9, 12, 22, 23, 24, 25.