Questions:

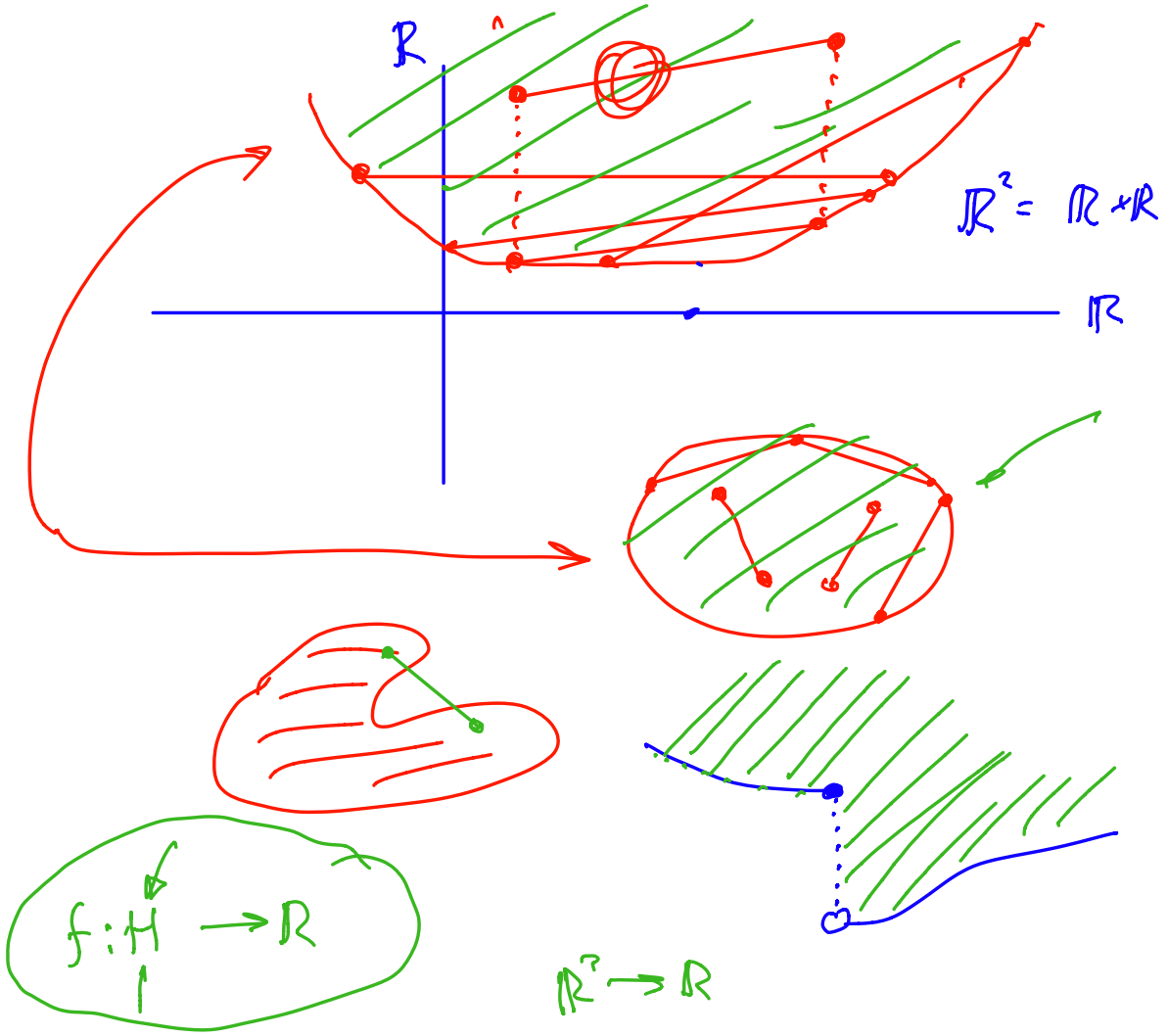
Madison
Bryanna
Jwahoon

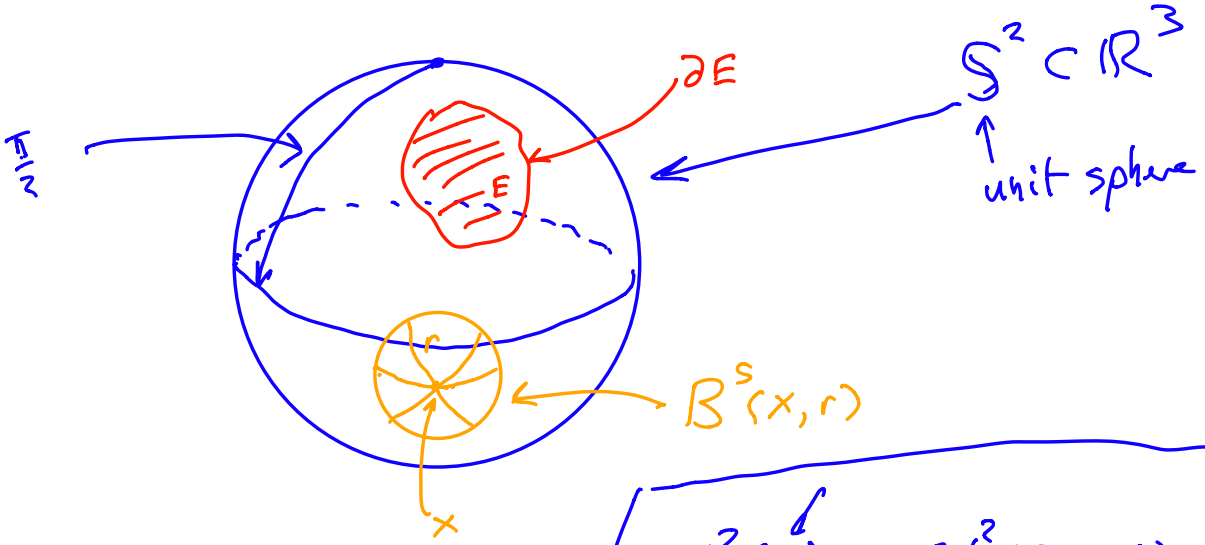
Questions:

1. epigraphs and convex sets (Micki)
2. ⓐ go over fig. 3.4 on page 111 (willow)
   ⓑ S^n vs. S^{n-1}
3. 5.2.4 union bounds (Anne)
4. Hölder $\Rightarrow$ $\leq$ (Sean)

$f: \mathbb{R} \to \mathbb{R}$ $\quad f(\alpha x + (1-\alpha)y) \leq \alpha f(x) + (1-\alpha) f(y)$

epi(f) is a convex set





$\mathcal{H}^2(S^2) = 4\pi$

$\mathcal{H}^2(\text{hemisphere}) = 2\pi$

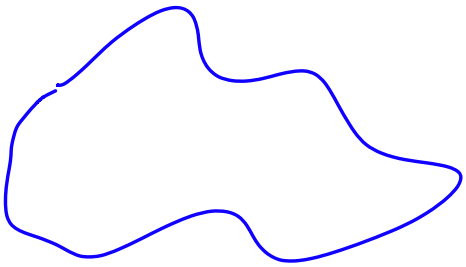
$\mathcal{H}^1(\partial(\text{hemisphere})) = 2\pi$

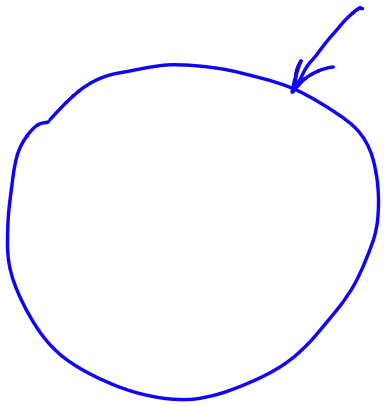
$\pi\left(\frac{\pi}{2}\right)^2 \quad \frac{\pi^3}{3}$

$2\pi\,\frac{\pi}{2} \quad \pi^2$

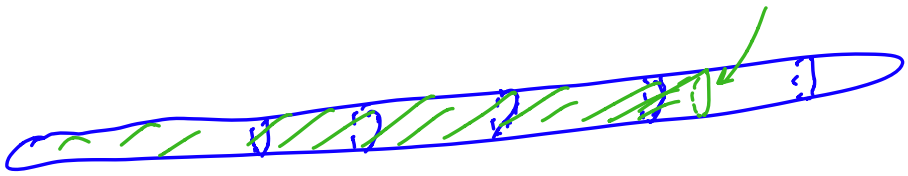
$\mathcal{H}^2(E) = \mathcal{H}^2(B(x,r))$

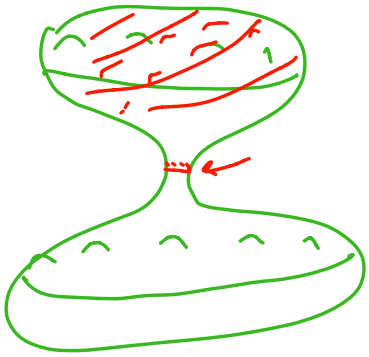
$\mathcal{H}^1(\partial E) \geq \mathcal{H}^1(\partial B(x,r))$



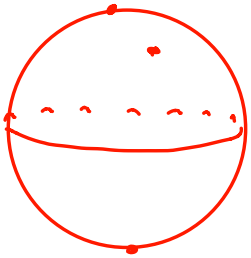


$$\frac{(\mathcal{H}^1(\partial E))^2}{\mathcal{H}^2(E)} \geq \frac{(2\pi r)^2}{\pi r^2} = 4\pi$$





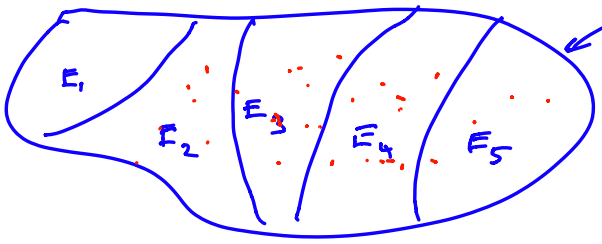
S^n S^{n-1}



$\mathbb{R}^3$

$S^2 = \{x \in \mathbb{R}^3 \mid |x| = 1\}$

$S^{n-1} = \{x \in \mathbb{R}^n \mid |x| = 1\}$



$\mu(E) = 1$

$P\{x \in E_i\} = \mu(E_i)$

$1 + x \leq e^x$

$1 - \mu(E_i)$

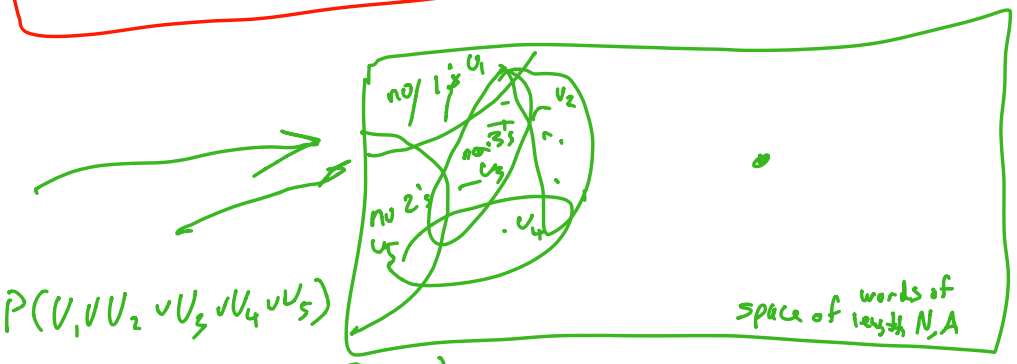
probability of never hitting E_i $\left(1 - \frac{1}{5}\right)^N$

$\leq e^{-\frac{N}{5}}$

$5e^{-\frac{N}{5}}$

$Me^{-\frac{N}{M}}$

$\frac{N}{M} \to \infty$



$P(U_1 \cup U_2 \cup U_3 \cup U_4 \cup U_5)$

$< P(U_1) + P(U_2) \cdots + P(U_5)$

$A = (1, 2, 3, 4, 5)$

1 3 3 5 1 4 . .

1 2 3 ... N

1 3 3 5 1 4 ...

5^N

Holder's Inequality

$$\int |fg| \le |f|_p \, |g|_q \qquad \left(\frac{1}{p} + \frac{1}{q} = 1\right)$$

$$|x \cdot y| \le |x|\,|y|$$

$$x \cdot y = \cos\theta \, |x|\,|y|$$

$$|x \cdot y| \le |x|_2 \, |y|_2$$

$$\frac{a^p}{p} + \frac{b^q}{q} \ge ab$$

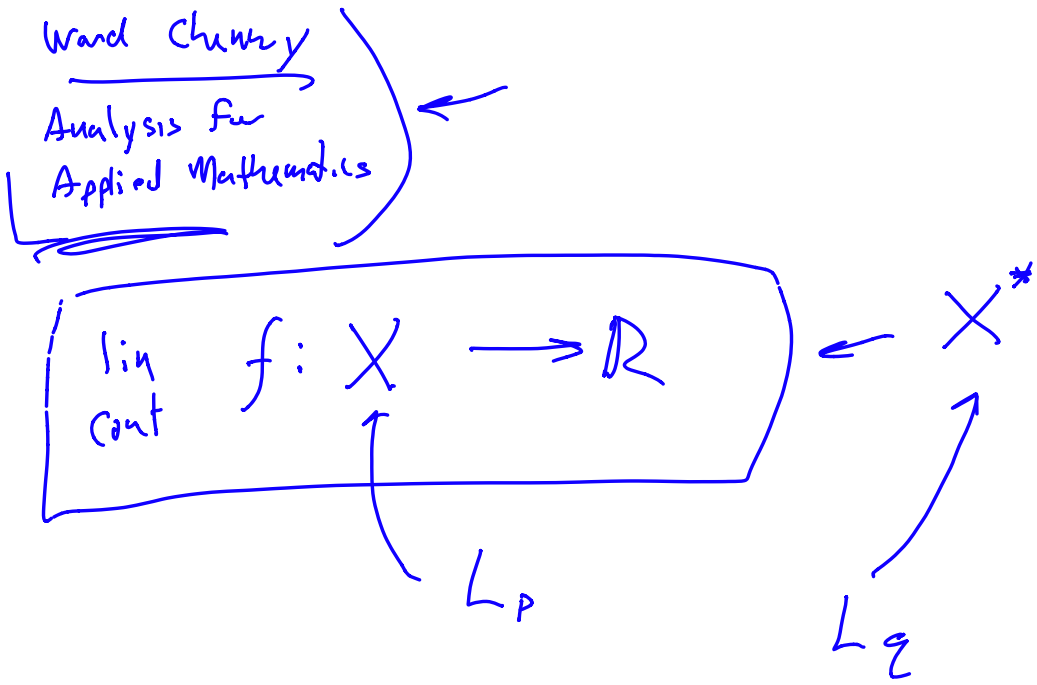
$$\frac{a^2}{2} + \frac{b^2}{2} \ge ab$$

convex: $f\left(\frac{1}{p}x + \frac{1}{q}y\right) \le \frac{1}{p} f(x) + \frac{1}{q} f(y)$

e.g. e^x

concave: $f\left(\frac{1}{p}x + \frac{1}{q}y\right) \ge \frac{1}{p} f(x) + \frac{1}{q} f(y)$

e.g. log


Ward Cheney
Analysis for
Applied Mathematics
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cont
$f: X \to \mathbb{R}$
X^*
L_p
L_q