

Name:

Solve the following **two** questions.

- [5] 1. Suppose that $u, v \in V$ are such that $\|u\| = 3$, $\|u + v\| = 4$, and $\|u - v\| = 6$. What is the value of $\|v\|$?

- [5] 2. Prove that for all positive numbers $a, b, c, d \in \mathbb{R}$, we have

$$16 \leq (a + b + c + d) \left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d} \right).$$

See the back of the page if you want to earn 5 **bonus** points:

Total: 10 points

- [5] 3. Suppose that V is a real inner product space. Prove that

$$\langle u, v \rangle = \frac{\|u + v\|^2 - \|u - v\|^2}{4}$$

for all $u, v \in V$.