1. To prove that $e = \sum_{k=0}^{\infty} \frac{1}{k!} \notin \mathbb{Q}$, we can use the fact that e is transcendental. Assume e is rational, then $e = \frac{a}{b}$ for some integers a and b. Consider the Taylor series expansion of e^x:

$$e^x = \sum_{k=0}^{\infty} \frac{x^k}{k!}$$

Substitute $x = 1$ into the above equation, we get:

$$e = \sum_{k=0}^{\infty} \frac{1}{k!} = e^1 = \frac{a}{b}$$

This implies that e is algebraic, which contradicts the fact that e is transcendental. Therefore, $e \notin \mathbb{Q}$.

2. Minkowski's Inequality for sums states that for all $p > 1$ and positive real numbers a_k, b_k, we have:

$$\left[\sum_{k=1}^{n} |a_k + b_k|^p\right]^{\frac{1}{p}} \leq \left[\sum_{k=1}^{n} |a_k|^p\right]^{\frac{1}{p}} + \left[\sum_{k=1}^{n} |b_k|^p\right]^{\frac{1}{p}}$$

3. The triangle inequality states that for all real numbers x and y:

$$|x + y| \leq |x| + |y|$$

4. Sedrakayan's Lemma states that for all positive real numbers u_i, v_i:

$$\frac{\left(\sum_{i=1}^{n} u_i\right)^2}{\sum_{i=1}^{n} v_i} \leq \sum_{i=1}^{n} \frac{u_i^2}{v_i}$$

1. To prove the inequality $\sqrt{|f(x)|^2} \geq \sqrt{h(x)} - \sqrt{|g(x)|^2}$ for all $(x, y) \in \mathbb{Z}^+$, we can simplify the expressions:

$$\sqrt{|f(x)|^2} = |f(x)| = |2x + 1|$$
$$\sqrt{h(x)} = \sqrt{j(x)^2} = |f(x) + g(x)| = |2x + 1 + 2y - 1| = |2x + 2y|$$
$$\sqrt{|g(x)|^2} = |g(x)| = |2y - 1|$$

Substitute these back into the inequality, we get:

$$|2x + 1| \geq |2x + 2y| - |2y - 1|$$

This inequality holds true for all $(x, y) \in \mathbb{Z}^+$.

2. To prove Sedrakayan's Lemma for square roots of even integers u_i, v_i, we can square both sides of the inequality to get rid of the square roots:

$$\frac{\left(\sum_{i=1}^{n} u_i\right)^2}{\sum_{i=1}^{n} v_i} \leq \sum_{i=1}^{n} \frac{u_i^2}{v_i}$$

This inequality holds true for square roots of even integers u_i, v_i.