**Question 1.** Suppose \( G \) is a group.

1. Suppose \( N \) is a normal subgroup of \( G \) and \( G \) is finitely generated. Then the quotient group \( G/N \) is also finitely generated.

2. If \( N \) is normal in \( G \) with both \( N \) and \( G/N \) finitely generated. Then \( G \) is finitely generated.

3. If \( H \leq G \) a subgroup of a group \( G \), with \( H \) finite index, then \( H \) finitely generated if and only if \( G \) is. The only if is easier to prove using geometry!

**Question 2.** Suppose \( G \) is a finitely generated group. Show that for any two finite (may as well assume symmetric) generating sets \( S, T \), that \( C(G, S) \) is QI to \( C(G, T) \).

**Question 3.** Show that the composition of two QI’s is a QI and that QI is an equivalence relation on metric spaces.

**Question 4.** Verify what I said about \( T_3 \) and \( T_4 \) being QI and show that \( T_m \) is QI to \( T_n \) for any \( m \neq n \) both greater than or equal to 3.

**Question 5.** Suppose \( \phi : \Gamma_1 \to \Gamma_2 \) is a homomorphism between finitely generated groups. Show that if \( \phi \) is a quasi-isometric embedding then \( \ker(\phi) \) is finite and that \( \phi \) is a quasi-isometry if and only if \( \ker(\phi) \) and \( \Gamma_2/\im(\phi) \) are both finite.

**Question 6.** Think about why \( F_2 \) and \( \mathbb{Z}_2 \) cannot be quasi-isometric. I am not asking you to write a proof of this - you need some machinery to write a real proof - but can you ”explain” why they shouldn’t be?