Sets, Graphs, & Invariants

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

1. Let $S = \{a, b, c\}$ and $T = \{a, b\}$. We want to show $S \ncong T$.

   (a) If we use the definition of $\cong$, what would we need to prove?

   (b) Find another tool/theorem/approach that would be easier to show $S \ncong T$?

2. Brainstorm (or scan Giusti's text) tools/theorems/approaches that we could leverage to show two graphs are *not* isomorphic. Note several definitions are given below.

   (a) Try to leverage the idea of the *degree*.

   (b) Try to leverage the idea of the *degree sequence*.

   (c) Try to leverage the idea of graph homomorphisms from line graphs of length n.

   (d) Try to leverage the idea of path components.

Definition 0.1. Let $\Gamma = (V, E)$ be a graph with $v_i \in V$. The *degree* of v_i is the number of edges that contain v_i. The *degree sequence* of Γ is the list of degrees of all vertices in V in descending order.

Definition 0.2. The *line graph of length* 1, is the graph $L = (\{v_1, v_2\}, \{v_1v_2\})$.
The *line graph of length* 2, is the graph $L = (\{v_1, v_2, v_3\}, \{v_1v_2, v_2v_3\})$.
The *line graph of length* 3, is the graph $L = (\{v_1, v_2, v_3, v_4\}, \{v_1v_2, v_2v_3, v_3v_4\})$.
The *line graph of length* n, is the graph $L = (\{v_1, ...v_{n+1}\}, \{v_1v_2, v_2v_3, ...v_nv_{n+1}\})$.

Recall the Math Major's fifth listed Student Learning Objective (SLO):
"Math majors will be able to describe how mathematical or quantitatively-based arguments affect society"

1. Let's take a snap shot of where we are now... how would you "describe how mathematical or quantitatively-based arguments affect society"?

2. Can a project in this class better inform your answer to the above? If so, how? If not, what academic assignment would better inform your answer to the above?