

Prework 7.2a: Polynomial-Time Languages

Write your preliminary solutions to each problem and submit a PDF on Canvas. The names in brackets indicate the subset responsible for presenting the problem.

1. [Micah, David, Todd] Let D be a TM decider for E_{DFA} . Classify each of the following objects as *languages*, *strings*, *machines*, or something else.

$$D, \quad E_{\text{DFA}}, \quad \langle D \rangle, \quad A_{\text{TM}}, \quad \text{RELPRIME}, \quad \langle 17, 31 \rangle, \quad P$$

2. [Curtis, Andrew, Connor] Step through the Euclidean algorithm (in Theorem 7.15) to decide if $\langle 10505, 1274 \rangle$ is an element of *RELPRIME*. Keep track of the values of x and y in each iteration of the algorithm.
3. [Ky, Joshua, Grace] Suppose that A and B are languages, and $A \in P$ and $B \in P$.
- Show that $A \cup B \in P$.
 - Show that $A \circ B \in P$. (Recall that $A \circ B = \{xy \mid x \in A \text{ and } y \in B\}$.)
 - Show that $\bar{A} \in P$.
4. [Allie, Ben, Levi, Meghan] On pages 185–186 there is a high-level description of a TM that decides the following language.

$$A = \{\langle G \rangle \mid G \text{ is a connected undirected graph}\}$$

Show that $A \in P$.

BEGIN YOUR SOLUTIONS BELOW THIS LINE
