York University EECS 4171A Eric Ruppert October 31, 2025

Homework Assignment #7
Due: November 7, 2025 at 11:59 p.m.

[4] **1.** Exercise 5.26 on page 213 of the course kit.

2. Consider the algorithm we studied in class that solves Byzantine agreement tolerating up to f Byzantine failures in a complete synchronous network of n processes when $n > 4f$. (It also appears on page 207 of the course kit.) Inputs to the algorithm can be any integers. The algorithm satisfies the following two properties:

- Agreement: Every correct process outputs the same value.
- Weak validity: If every correct process has input v, then every correct process outputs v.

In the questions below, we also consider a stronger version of the validity property:

- Strong validity: The output of each correct process is the input of some correct process.

[3] **(a)** Show that the assumption that $n > 4f$ is really crucial for that algorithm's correctness. In other words, for every $f > 0$, construct an execution for $n = 4f$ processes that violates agreement or weak validity.

[3] **(b)** Show that the algorithm does not guarantee strong validity even when $n > 4f$.

[3] **(c)** Suppose that inputs of correct processes can come from the set $\{1, 2, 3, 4\}$. Prove that *no* algorithm can guarantee strong validity and agreement when $n = 12$ and $f = 3$.