1. Describe (at a high-level) how to design a universal Turing machine that handles Turing machines with tape alphabet $\Gamma = \{0, 1, \#\}$.

2. Describe (at a high-level) how to design a universal Turing machine that handles Turing machines with arbitrary tape alphabet.

3. Describe (at a high-level) how to simulate a 2-tape Turing machine with a single-tape Turing machine.

Two track tape

$\delta(q, a_1, a_2) = \langle q', a_1', \{q_1, q_2\}, b'\rangle$

$\delta$ - handling pairs of symbols, pair of tape heads movements.

(Useful here to allow 'N' to add to 'L' and 'R' for tape head movement)

Two-track tape

Tape alphabet becomes $T \times T$
Add markers for face head position.

Remember (with finite control) whether the markers are leftward or rightward.