Describe Turing machines that compute the following functions.

In particular, specify the transition functions $\delta \colon Q \times \Gamma \to Q \times \Gamma \times \{-1, +1\}$ for each machine either by writing out a table or by drawing a graph. Recall that $\delta(p, \$) = (q, @, +1)$ means that if the Turing machine is in state p and reads the symbol $\$$ from the tape, then it will change to state q, write the symbol $@$ to the tape, and move one step to the right. In a *drawing* of a Turing machine, this transition is indicated by an edge from p to q with the label "$\$/@, +1$".

Give your states short mnemonic names that suggest their purpose. Naming your states well won't just make it easier to understand; it will also make it easier to design.

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1. DOUBLE: Given a string $w \in \{0, 1\}^*$ as input, return the string ww as output.

2. POWER: Given a string of the form 1^n as input, return the string 1^{2^n} as output.