

Construct a **Turing machine** that **computes** the function:

$$f(w \in \{0,1\}^*) = (\text{increment of } w \text{ by } 1 \text{ in binary})$$

where $f(w)$ is defined only if w starts with 1.

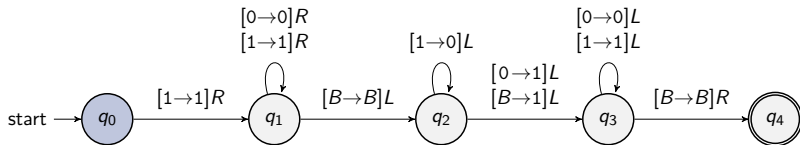
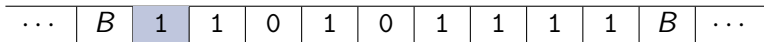
...	<i>B</i>	1	1	0	1	0	1	1	1	1	<i>B</i>	...
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- 1: Check if the first bit is 1.
- 2: Move to the end of the input.
- 3: Repeatedly replace the rightmost 1 with 0.
- 4: Replace 0 (or *B*) with 1.
- 5: Go to the first input symbol.

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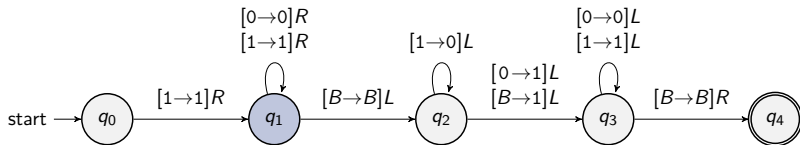
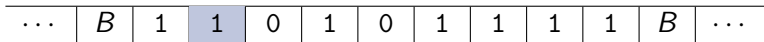


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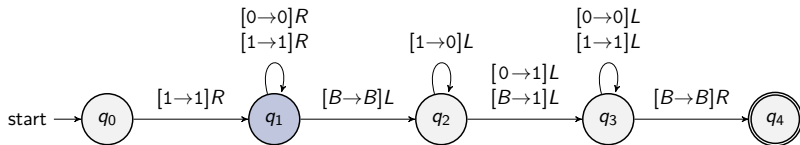
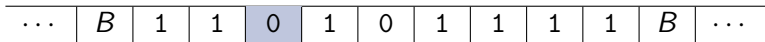


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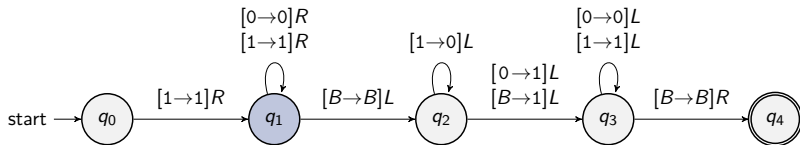


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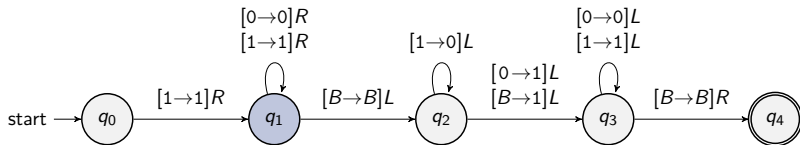


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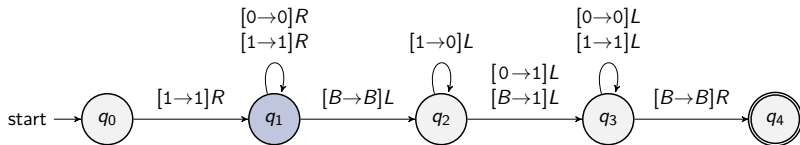
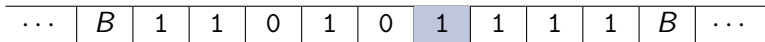
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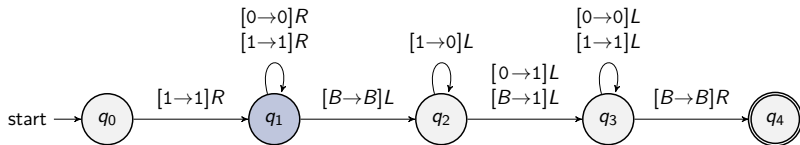
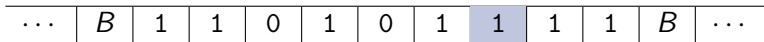
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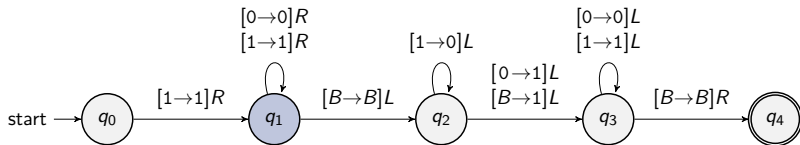


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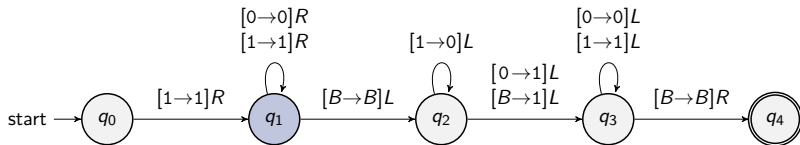
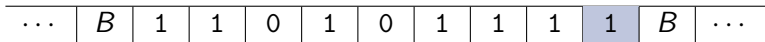
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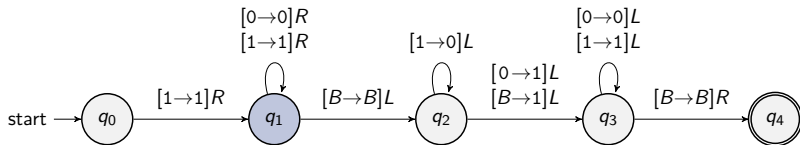
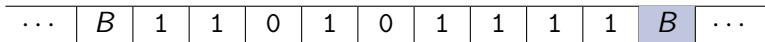
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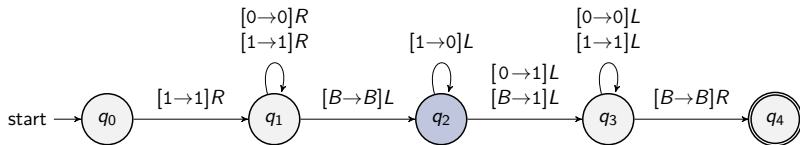
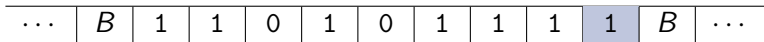
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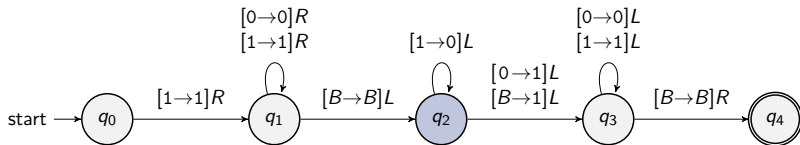
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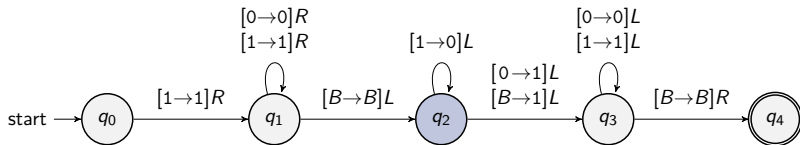


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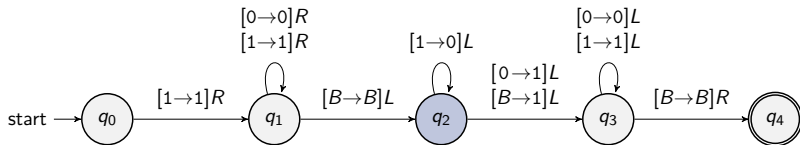


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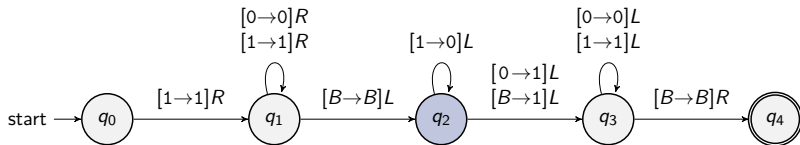
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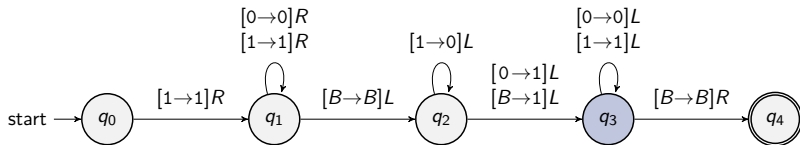
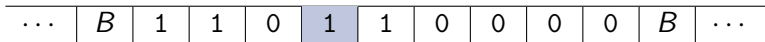


Replace 0 (or B) with 1.

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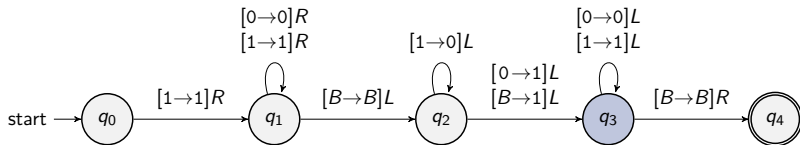
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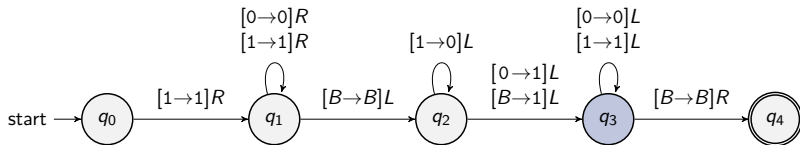
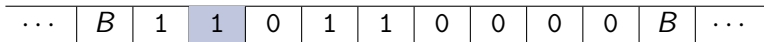
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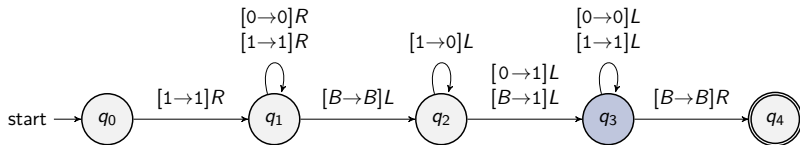
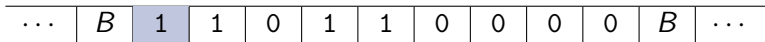
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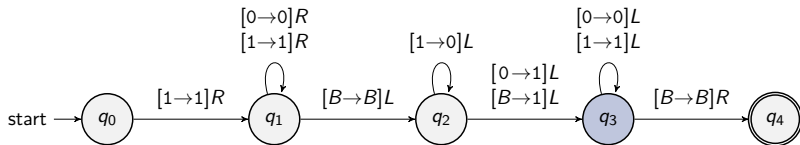
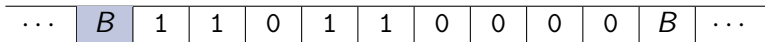
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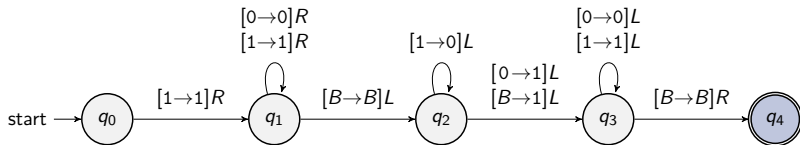
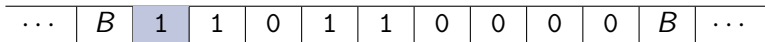
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Computed! $f(110101111) = 110110000$