

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

$$f(1^n + 1^m) = 1^{n+m} \quad \text{where} \quad n, m \geq 0$$

w =

...	B	1	1	1	+	1	1	B	...
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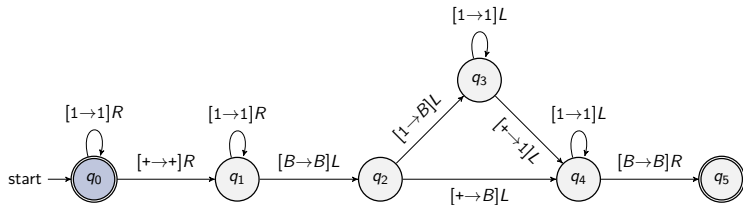
$f(w)$ =

...	B	1	1	1	1	1	B	B	...
-----	-----	---	---	---	---	---	-----	-----	-----

- 1: Find + after 1's
- 2: **if** the last symbol is 1 **then**
- 3: Find and Remove the last 1
- 4: Find and Replace the + with 1
- 5: **else**
- 6: Remove the +
- 7: Go to the first input symbol

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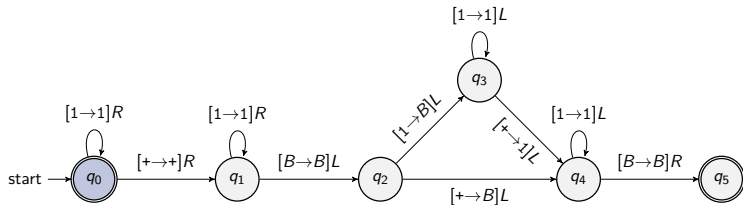
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Find + after 1's.

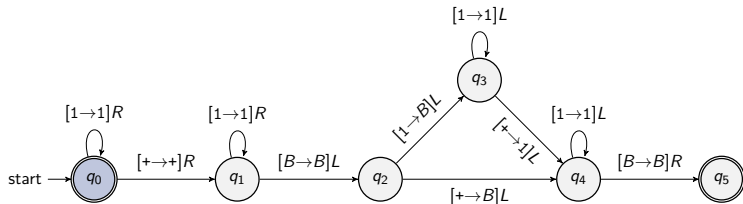
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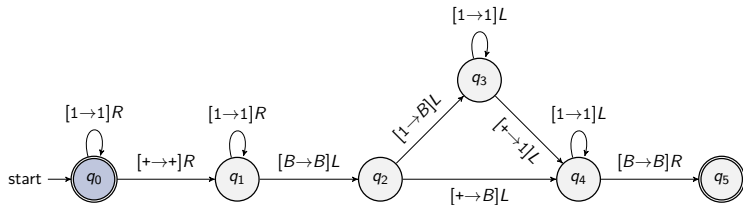
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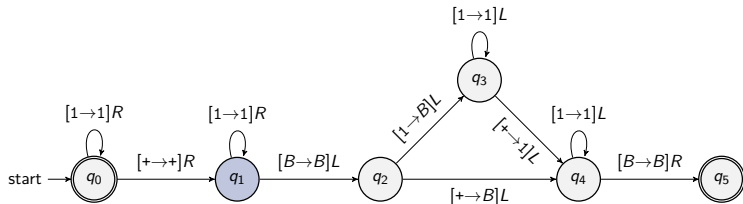
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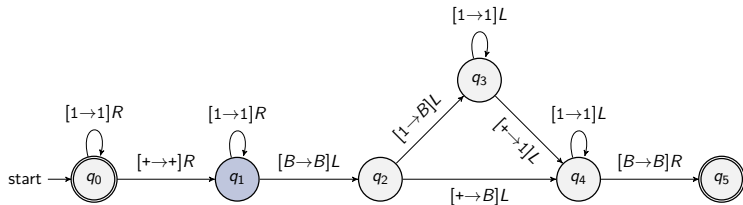
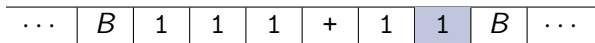
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Check if all remaining symbols are 1.

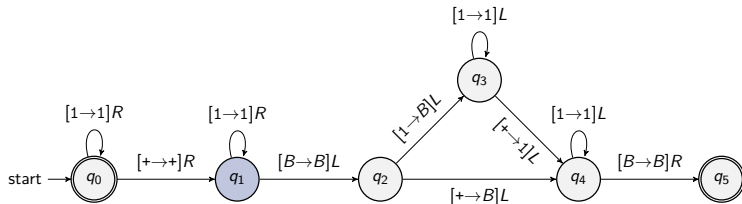
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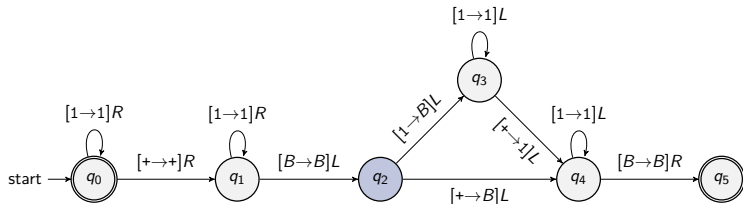
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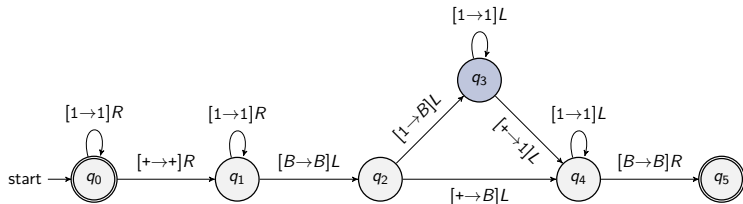
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Since the last symbol is 1, find and remove the last 1.

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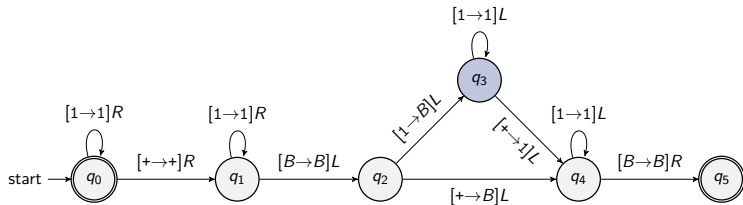
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Find and Replace the + with 1.

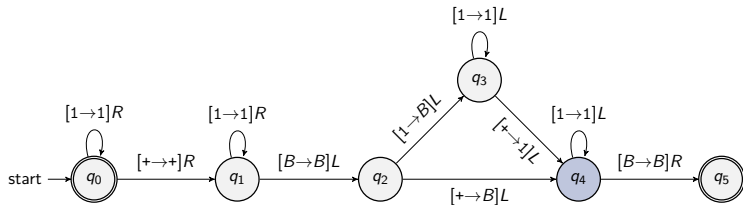
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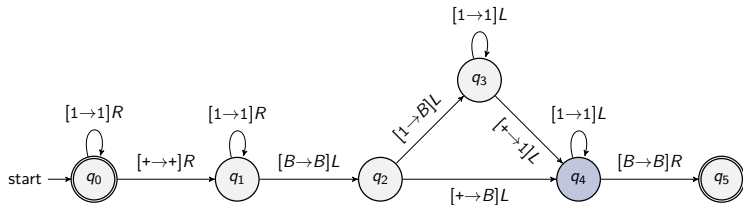
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Go to the first input symbol.

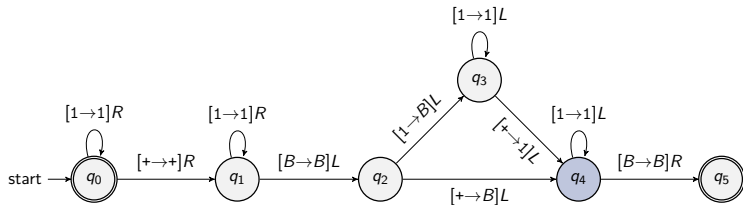
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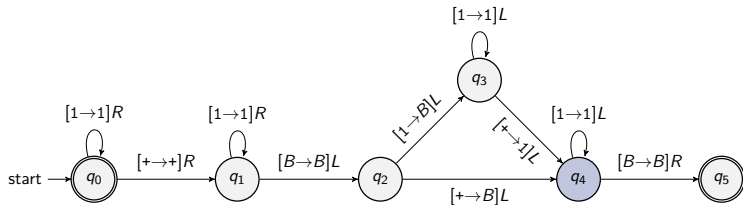
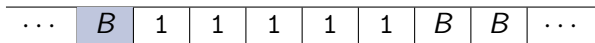
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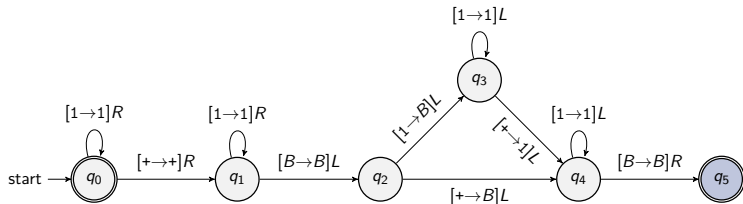
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Computed! $f(111+11) = 11111$