

Make a TM that accepts $a^n b^n$

Start with aaabbb on the tape.

Strategy: Marking

"mark" the first a - (change it to x.)

then mark a matching b,

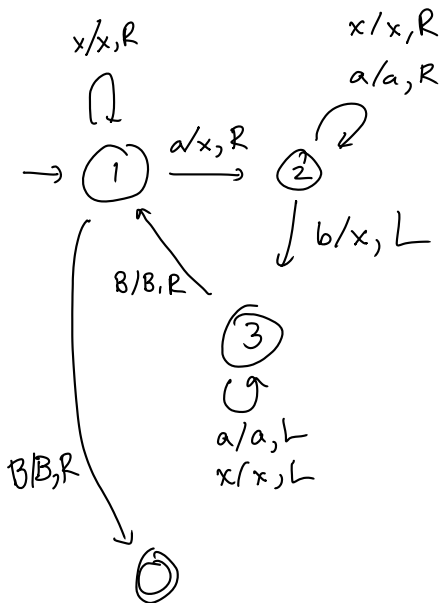
then go back to the beginning & repeat.

For aaabbb, the tape looks like

aaabbb
 xaaabbb
 x a a x b b
 x x a x b b
 x x a x x b
 x x x x x b
 x x x x x x

Steps:

Steps: Mark a, move R } 1
 move R until we see b,
 mark the b } 2
 move L until we see B, } 3
 move R until we see a,
 repeat }



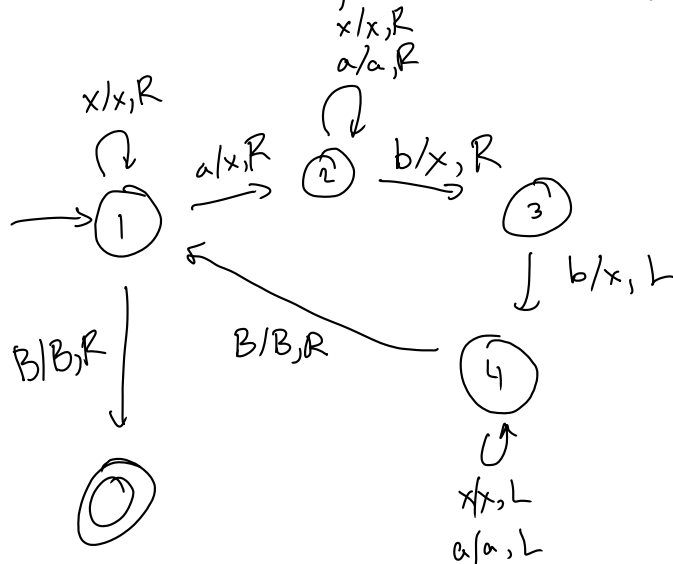
Let's show $aabb$ is accepted:

$B1aabbB \mapsto Bx2abbB \mapsto Bxa2bbB \mapsto Bx3axbB$
 $\mapsto B3xaxbB \mapsto B3BxaxbB \mapsto B1xaxbB$
 $\mapsto Bx1axbB \mapsto Bxx2xbB \mapsto Bxxx2bB$
 $\mapsto Bxx3xxB \mapsto Bx3xxxxB \mapsto B3xxxxxB$
 $\mapsto B3BxxxxB \mapsto B1xxxxxB \mapsto Bx1xxxB$
 $\mapsto Bxx1xxB \mapsto Bxxx1xB \mapsto Bxxxx1B$
 $\mapsto \text{accept!}$

Try $a^n b^{2n}$

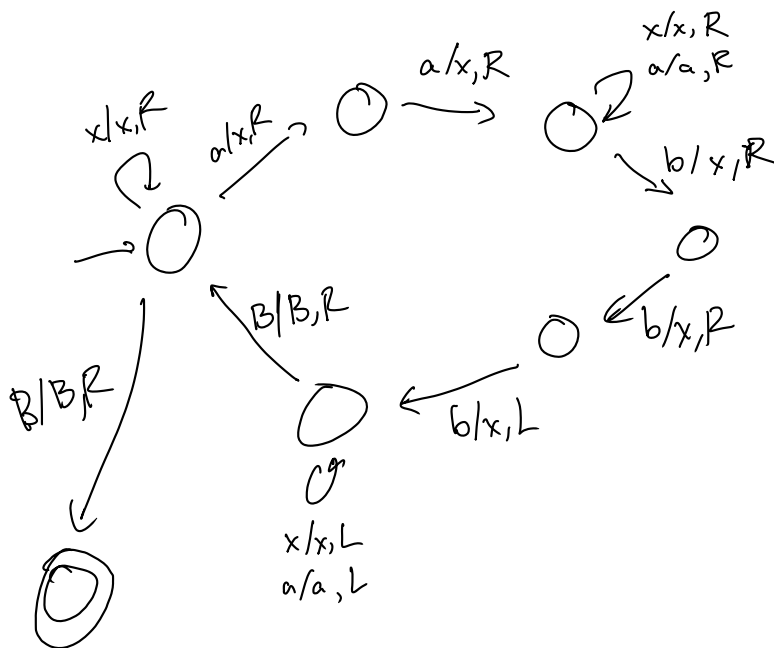
mark a , move R ,

mark b , mark another b , move L .



Try

$a^{2n} b^{3n}$



A TM for matched brackets.

$$\Sigma = \{ [,] \}$$

accepts if the brackets match up.

$[[] []]$ ✓

$[[]$ ✗

$[] [[]]] [$ ✗

We'll do it by marking:

$[[] [[]]]$

$[[]] []$

Start with the left-most $]$,
move L , match with the nearest $[$

at the end
run L all the
way, make sure
it's all x's.

$$\{ [\] \ (\) \}$$
$$[[x[[[]]]]]$$
$$\cancel{L} \times [[]]]$$
$$[x \times [0x]]$$
 ~~$[x \times [x \times]]$~~
$$[x \times [x \times x]]$$

[x x y x x x]

[x x x x x x x

$$\{ [[[[x \times x \times x \times x \times x \times x]]]]$$
 $x/x, R$
$$\mathbb{C}/\mathbb{C}, \mathbb{R}$$
