Notes 6.5
False Proof Example

Prove that $L = \{ a^n b^m : n+m \text{ is even} \}$ is not a regular using the pumping lemma.

Choose n as in the lemma.
Let $w = a^n b^n \in L$.
By pumping lemma, $w = xyz$ where $|xy| \leq n$, $|y| \geq 1$ and $xy^i z \in L \ \forall i$.
Let $x = a^{n-1}$ and $y = a$.
Pump up. to xy^2z.
Since we added one "a" to xyz, (xy^2z) we have $n+1$ a's and n b's with $(n+1)+n$ an odd number.
Contradiction!