For the following languages on $\sum = \{a,b\}$. Develop the following regex

1. All strings with exactly one *a*.

2. All strings with no more than three *a*'s

3. For the following languages on $\sum = \{a,b\}$

   a. $L = \{w: |w| \bmod 3 = 0\}$
   b. $L = \{w: |w| \bmod 5 \neq 0\}$
   c. $L = \{w: n_a(w) \bmod 3 > 1\}$

4. a^n: $n \geq 0$, $n \neq 4$

SOL:

1. b*ab*
2.
   - 0 a': b*
   - 1 a: b*ab*
   - 2 a's: b*ab*ab*
   - 3 a's: b*ab*ab*ab*

→ b* | b*ab* | b*ab*ab* | b*ab*ab*ab*

3.
   a. ([ab][ab][ab])* → ((a|b)(a|b)(a|b))*

   b. ([ab][ab][ab][ab][ab])* → (((a|b)(a|b)(a|b) (a|b) (a|b)))* ((a|b)| (a|b)(a|b) | (a|b)(a|b)(a|b) | (a|b)(a|b)(a|b)(a|b))

   c. $n_a(w) \bmod 3 > 1$ → $n_a(w) = 3k + 2$ (k >= 0)
   → b*ab*((a|b)(a|b)(a|b))*b*ab*

4. a^n: $n \geq 0$, $n \neq 4$

epsilon| a|aa|aaa | aaaaaa*