6.3 No, if there were some generator $(a, b) \in \mathbb{Z} \times \mathbb{Z}$ we have that $(a, b)^n = (na, nb)$ but there is no possible power $n \in \mathbb{Z}$ such that $(a, b-1) = (na, nb) = (a, b)^n$ since $a = na$ implies that $n = 1$ but then $nb \neq b - 1$.

6.5 For any element $(a, b) \in A \times B$ we have $(a, b) \circ (a^{-1}, b^{-1}) = (e_a, e_b)$, and $(a^{-1}, b^{-1}) \in A \times B$ since, A, B are groups. Therefore every element has an inverse. We already know the operations are assosiative since crossing two associative operations is an associative operation, and finally we know $A \times B$ is closed under these operations since we just apply the operations component wise and A, B are closed under their respective operation. Therefore $A \times B$ is a subgroup of $G \times H$

6.10 We have

$$\{(0,0)\}, \langle(1,0)\rangle, \langle(1,1)\rangle, \langle(0,1)\rangle, \langle(0,2)\rangle, \langle(1,2)\rangle$$

For a total of 6 subgroups

6.12 (i). If a generator of G, H is g, h respectivly, then a generator of $G \times H$ is (g, h) for any element $(a, b) \in G \times H$ since G, H are cyclic we know there is some n, m such that $(a, b) = (g^n, b^m)$,

13.10

13.11

13.16

13.20

13.25