1. True. Because for every element in A, there must be one and only one image in B, the number of elements in set B that has a preimage is the same as the number of elements in set A. Since function g is injective, indicating that all elements in B which has a preimage in function f has one and only one image in set A. Although g(f(x)) might be another element in A, not necessarily x itself, the image set of g(f(x)) still equal to A.
2. False. The result of B×A is a set of all ordered pairs (g(x),f(y)). However, the results of A×B is a set of all ordered pairs (f(x),g(y)), which is not the same as (g(x),f(y)).
3. False. For example, A=(a1,a2,a3), B=(b1,b2,b3), f(a1)=b3, f(a2)=b2, f(a3)=b1 and g(b1)=a1, g(b2)=a3, g(b3)=a2. f(A) × g(B)=(b3,b2,b1) × (a1,a3,a2), which has nine elements while (f(x),g(y)) has only three elements.