1. Show the following identities.

(a) **(2 points)** If $n \geq k$, then

$$n\binom{n-1}{k-1} = k\binom{n}{k}.$$

Hint: For question (a), you may consider a justification using a combinatorial argument or a factorial calculation.

(b) **(2 points)** If $m \geq k$ and $n \geq k$, then

$$\binom{m+n}{k} = \sum_{j=0}^{k} \binom{m}{j}\binom{n}{k-j}.$$

Hint: For question (b), you may consider a justification using a combinatorial argument.