Questions

Question 1: Determine whether the function $f : N \longrightarrow \mathbb{Z}$ defined by $f(x) = f(x-1) + f(x-2)$, $f(1) = 2$, $f(2) = -1$, is one-to-one.

Question 2: Find the inverse of the function $f : \mathbb{R}^+ \longrightarrow (1, e)$, defined by $f(x) = e^{\frac{x}{x+3}}$.

Question 3: Find the coefficient of $x^3y^4z^5$ in the binomial expansion of $(x+y-z)^{12}$.

Question 4: Prove that for all $n \in \mathbb{N}$:

$$2C(n,1) + 4C(n,2) + 6C(n,3) + ... + (2n-2)C(n,n-1) + 2nC(n,n) = n \cdot 2^n.$$