COMP3121 Homework Q5

Arth Sanskar Patel
z5228942

June 28, 2020

1 Answer

We need to find a sequence x such that $x * \langle 1, 1, -1 \rangle = \langle 1, 0, -1, 2, -1 \rangle$. Let $F(y)$ be polynomial associated with $\langle 1, 1, -1 \rangle$ and $H(y)$ be polynomial associated with $\langle 1, 0, -1, 2, -1 \rangle$. The length of sequence x is $5 + 1 - 3 = 3$, let it be $\langle a, b, c \rangle$ and the polynomial associated with it be $G(y)$. Therefore in other words we need to find $G(y)$ such that,

$$G(y) * F(y) = H(y)$$

$$G(y) * (1 + y - y^2) = 1 - y^2 + 2y^3 - y^4$$
$$G(y) * (1 + y - y^2) = 1 - y^2 + 2y^3 - y^4$$
$$(a + by + cy^2) * (1 + y - y^2) = 1 - y^2 + 2y^3 - y^4$$
$$a + (a + b)y + (-a + b + c)y^2 + (-b + c)y^3 - cy^4 = 1 - y^2 + 2y^3 - y^4$$

Comparing the coefficients of the LHS and RHS, we get,

$$a = 1$$

$$a + b = 0$$

$$-a + b + c = -1$$

$$-b + c = 2$$

$$c = 1$$

Solving the equations above we get $a = 1, b = -1, c = 1$, hence the polynomial $F(y) = 1 - y + y^2$ and the sequence $x = \langle 1, -1, 1 \rangle$. Therefore $\langle 1, -1, 1 \rangle * \langle 1, 1, -1 \rangle = \langle 1, 0, -1, 2, -1 \rangle$