Autoregressive Linear Modeling

You are given the following sequence of numbers:

t	x_t
0	0
1	1
2	2
3	1
4	-4
5	-11
6	-10
7	13
8	56
9	73

1. **Setting Up the Autoregressive Model**
   Using the first 7 terms of the sequence (from $t = 0$ to $t = 6$), set up a linear autoregressive model with a time window of 1. More specifically, your model should have the form:

   $$x_t = ax_{t-1}$$

   where a is a constant to be determined. Formulate the least squares problem to estimate the coefficient a and solve it.

2. Repeat (a) but with a time window of 2. Your model should have the form:

   $$x_t = ax_{t-1} + bx_{t-2}$$

   where a and b are constants to be determined. Formulate the least squares problem to estimate the coefficient a and solve it.

3. **Sequence Extension**
   Using the estimated coefficients a (or a and b), generate the values of x_t for $t = 7$ to $t = 9$ using the autoregressive model. Compare the values obtained using your autoregressive model with the actual sequence values provided above for $t = 7$ to $t = 9$. Calculate the differences and discuss the accuracy of your model.