Directions: Answer the problem given below.

1. Let $a_1, a_2, a_3, \ldots$ be the sequence defined as follows:

$$a_1 = 2, a_2 = 20, \text{ and } a_n = 6a_{n-1} - 8a_{n-2} \text{ for all } n \geq 3.$$

Prove that for all integers $n \geq 1$, $a_n = 2 \cdot 4^n - 3 \cdot 2^n$.