Provide a clear and organized presentation. Show all of your work, provide exact values only, and completely simplify your answers.

1. (8 pts) If $a_n = -\sqrt{3}a_{n-1} + 6a_{n-2}$ and $a_0 = -1$ and $a_1 = 3$, then determine an explicit formula for $a_n$

2. (10 pts) If $a_n = 3a_{n-1} + 10a_{n-2}$ and $a_0 = 2$ and $a_1 = -1$, then use a generating function to determine an explicit formula for $a_n$

3. (8 pts) If $f\left(x\right)=\ln x$ , then determine an explicit formula for the $n^{th}$ order derivative.

4. (8 pts) Recall the Fibonacci sequence: 1,1,2,3,5,8,13,…. Prove that:

$$f_1 + f_3 + f_5 + \cdots + f_{2n-1} = f_{2n} \quad \forall n \in \mathbb{N}$$

5. (8 pts) Use *Mathematical Induction* to prove that our formula for computing the sum of the first *n* terms of an arithmetic series is valid.

6. (8 pts) Use *Mathematical Induction* to prove that our formula for computing the sum of the first *n* terms of a geometric series is valid.