Assignment 2

1.1 Use induction to prove $F_i = \frac{\phi^i - \hat{\phi}^i}{\sqrt{5}}$; where $F_i = F_{i-2} + F_{i-1}$, and ϕ is the golden ratio $\frac{1+\sqrt{5}}{2}$.

To prove by induction, write out the expressions f_n and f_{n+1} (note: f_{n+1} is the same as f_n, but with $(n+1)$ substituted everywhere in place of n). Next, if applicable, re-write the expression f_{n+1} in terms of f_n then perform algebraic manipulations on the expression until you reach some variation of $f_{n+1} = f_{n+1}$. Lastly, show that the expression f_c also holds for some constant c. The algebra is called "the inductive step", and the calculation for on the constant is called "the base case".

In this problem, the expression to prove is $F_i = \frac{\phi^i - \hat{\phi}^i}{\sqrt{5}}$, where $\phi = \frac{1+\sqrt{5}}{\sqrt{5}}$. Start by demonstrating the expression holds for constants $c = 0, c = 1$ (e.g., the "base case").