

## 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  $\phi$  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  $\phi = \frac{1+\sqrt{5}}{2}$ . Start by demonstrating the expression holds for constants  $c = 0, c = 1$ .