**Combinatorics HW recurrence relations – 1**

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1. **Please prove the following equation of Fibonacci sequence Fi:**

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Since , where n>2 and , we can prove by induction that assuming , then we would have that . By taking out of the second sum , we get

Which based on the assumption gives

Hence, it is proven by mathematical induction that the sum of odd-indexes of the Fibonacci sequence until is .

1. **Please provide the corresponding characteristic equation for the following recurrence relation:**

The above equation can be written as to form the kth order linear homogeneous recurrence relation of {}. Accordingly, the characteristic equation is

1. **Solve the recurrence relation *hn*=2*hn*-1+8*hn*-2 ,n≥2, *h*1=1, *h2*=10.**

The above equation can be written as to obtain the characteristic equation . Hence 4 and -2 are derived as the roots of C(x), which allows to be re-written as . By observing the provided values of and , we can get

Multiplying the first equation by 2, gives

Giving 24A=12, which makes A=0.5 and B=0.5. Accordingly, we get .