

Analysis H – Hahn / Hlasek / Tantod
AtPS Quiz 2, 2023-24
NO CALCULATORS

25 points

Inducted into Math Analysis: _____
Period: _____

1. Simplify each expression to a single Fibonacci number. Show your work to receive full credit. [3 pts each]

a) $2(F_1 + F_4 + F_7 + F_{10} + \dots + F_{334}) =$

b) $F_{17} + 4F_{18} + 6F_{19} + 4F_{20} + F_{21} =$

2. Evaluate (“evaluate” means “give the value of”. Your answer should be a single number). Show the work that you used to arrive at your answer. [3 pts]

$$\sum_{5}^{\infty} 1024 \left(\frac{1}{2}\right)^n$$

3. Write this in Sigma Notation: [3 pts] $72 + 66 + 60 + 54 + \dots - 594 - 600$

4. Solve for x in terms of n and k, simplified as much as possible. Leave your answer in factored form (no need to multiply it out), and you can also leave factorials in your answer, if necessary. [2 pts]

$$\frac{(n-1)!}{(k-1)!(n-k)!} \cdot \frac{n!}{(k+1)!(n-k-1)!} = \frac{(n+1)!}{k!(n-k+1)!} \cdot \frac{(n-1)!}{k!(n-k-1)!} \cdot x$$

5. Consider the summation: $S = \frac{4}{5!} + \frac{5}{6!} + \frac{6}{7!} + \dots + \frac{102}{103!}$

We can use telescoping to write S as a compact expression if we replace the numerators like this:

$$S = \frac{5-1}{5!} + \frac{6-1}{6!} + \frac{7-1}{7!} + \dots + \frac{103-1}{103!}$$

Continue simplifying to write S as a compact expression. [3 pts]

6. Evaluate each (each answer should be a single number). [1 pt each]

a) $\binom{20}{3}$

b) $\binom{3}{-4}$

c) $\binom{-2}{7}$

d) $\binom{12}{15}$

7. Prove using Mathematical Induction: [4 pts] "11ⁿ - 6 is divisible by 5 for all values of n > 0"