MATH 113 SPRING 2023 NUMBER REVIEW DAY PROBLEMS

1. PROBLEM 1A

Does the recursive formula

$$S_{n+1} = 6S_n - 3$$

satisfy the non-recursive formula

$$S_n = 6n + 1?$$

2. PROBLEM 1B

Does the recursive formula

$$S_{n+1} = 6S_n + 1$$

satisfy the non-recursive formula

$$S_n = 6n + 1?$$

3. PROBLEM 2

Explain in words the pattern in the sequence

$$5, 11, 23, 47, \ldots$$

What is the relationship between the "previous" term and the "next" term? What will the next two numbers in the sequence be?

4. PROBLEM 3

Find a one to one correspondence between the natural numbers and the even natural numbers.

5. PROBLEM 4

Find the LCM and GCD of 60 and 32. Show the Venn Diagram you make.

6. PROBLEM 5

i) State the Twin Primes Conjecture.

ii) Give 3 examples of pairs of twin primes.

iii) Give an example of two prime numbers that are NOT twin primes.

iv) State a NEW conjecture about prime numbers. Be creative!

v) Are the prime numbers of size aleph naught? ($\aleph_0$) (Hint: remember first the definition of what it means for a set to be of size aleph naught)

7. PROBLEM 6

Transform

$$\psi = \frac{2}{2 + \frac{2}{2 + \frac{2}{\cdots}}}$$

into a quadratic equation involving ψ, using telescoping. You don't have to solve it. NOTE: quadratic means that ϕ^2 appears somewhere. (Hint: look at Day 8 Story, Slides 10-14)

8. PROBLEM 7

An NBA basketball player has is 7 feet tall and has feet that are 40 cm wide. If you are 5 feet tall and have feet like an NBA player's, how wide are your feet?

9. PROBLEM 8

Find a one-to-one correspondence between the integers and the natural numbers that are divisible by 3. Draw an arrow diagram.