## Extension/Math Questions for "The Man Who Knew Infinity" DO NOT WRITE ON THIS, USE YOUR OWN SHEET

- 1. In the movie, they reference a math term called a partition.
  - a. Google "Partition (number theory)" and write down what a partition is with an example.
  - b. Using the definition, how many partitions are there for the number 6? List them all.
- 2. During the movie, Ramanujan shares his work. One of his most important contributions to math was that for nested radicals.
  - a. Google "Nested radical" and write down what a nested radical is with an example.
  - b. One of Ramanujan's most famous nested radicals is  $\sqrt{1+2}\sqrt{1+3}\sqrt{1+4}\sqrt{1+5}\sqrt{1+\cdots}$ . Use

the following start to continue the pattern and show why this equals three.

$$3 = \sqrt{9} = \sqrt{1 + 2(4)} = \sqrt{1 + 2\sqrt{16}} = \sqrt{1 + 2\sqrt{1 + 3(5)}} = \cdots$$

c. Another of Ramanujan's famous nested radicals is  $\sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + \cdots}}}}$ . Use the following start to show why this equals 2.

$$x = \sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + \cdots}}}}$$

$$x = \sqrt{2 + x}$$

Now square both sides and then solve by factoring.

- 3. In the movie, Hardy takes a taxi with a specific number that Ramanujan shares is quite unique since that number is the smallest number expressible as the sum of two cubes in two different ways. What was that number again and what are the two ways it can be expressed as the sum of two cubes? (If stuck, Google "Hardy–Ramanujan taxi number").
- 4. One of the biggest obstacles in Ramanujan's path was the various forms of racial and cultural discrimination he faced. Write 4-5 sentences describing these as well as how in general Ramanujan's journey was more difficult than for his colleagues.

5. One of the main reasons I elect to show this film is to highlight the fact that mathematics is not just a field for older, white males. To provide further examples, you will Google one of the following people and answer some questions about them.

Ask your phone to choose a number between 1 and 6 (or roll a die). The number will be the person you research.

Hypatia (1), Ada Lovelace (2), Emmy Noether (3), Sophie Germain (4), Maryam Mirzakhani (5), Katherine Johnson (6)

With your person selected, research about them and answer the following questions.

- i. Write 4-5 sentences (in your own words!!!) detailing their mathematical work/contributions.
- ii. Write 4-5 sentences describing the time they lived and some obstacles of that time period that were in their way.