

9. [9 points] The blueprint for the Infinity Tower has been finalized, and the design of the Tower of Hanoi is accepted. Specifically:

- the tower will have infinitely many floors
- each floor has the shape of a solid cylinder of height of 3 meters
- the n th floor has radius $\frac{1}{2n^2}$ meters
- the ground floor corresponds to $n = 1$
- the tower has constant density δ kg/m³
- when construction begins, all materials are on the ground and have to be lifted to build each floor.

In this problem, you may assume the acceleration due to gravity is $g = 9.8$ m/s².

a. [7 points] Let W_n be the work, in Joules, it takes to lift the materials to build the n th floor and put that floor in place in the tower. Write an expression involving one or more integrals for each of the following.

i. $W_1 =$ _____

ii. $W_2 =$ _____

iii. $W_n =$ _____

b. [2 points] Write an expression involving one or more integrals and/or series that gives the total work it would take to build the entire tower. Your answer should not include the letter W .

Answer: _____