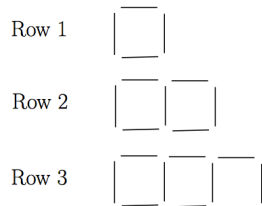


COMP406 Assignment #1

1. Dennis has some sticks that are all of the same length. He arranges them in squares and has made the following first 3 rows:



Four sticks are required to make the first square in Row 1, seven sticks are required to make 2 squares in the Row 2, and ten sticks are required to make 3 squares in Row 3.

- [2 marks] Use an expression, in terms of n , to describe the number of sticks required to make n squares in Row n .
 - [2 marks] Find the total number of sticks to complete all the squares of the first k rows.
 - [3 marks] Find the total number of sticks to complete all the squares from Row m to Row n (inclusive).
2. [2 marks] How many unique functions are there from $\{0, 1\}$ to $\{0, 1\}$? Explain your answer.
3. [2 marks] Determine whether each of the following function \mathbb{Z} to \mathbb{Z} is one-to-one:
- $f(n) = n + 3$
 - $f(n) = n^2$
4. [2 marks] Determine whether each of the following function \mathbb{Z} to \mathbb{Z} in Question 1 is onto.

5. Evaluate the following limits, if they exist.

a. [2 marks] $\lim_{t \rightarrow -5} \frac{t^2 + 6t + 5}{t^2 + 2t - 15}$

b. [2 marks] $\lim_{x \rightarrow \infty} \ln\left(\frac{3+x}{1+5x^3}\right)$

c. [4 marks] Let $f(x) = \frac{3e^{-14x} - e^{18x}}{e^{-x} - 2e^{20x} - e^{-9x}}$. Evaluate $\lim_{x \rightarrow -\infty} f(x)$ and $\lim_{x \rightarrow \infty} f(x)$.

6. [4 points] Given that $\sqrt{x+7} \leq f(x) \leq x-12$ for all x determine the value of $\lim_{x \rightarrow 9} f(x)$.