(5 marks) 1. The nth term, u_n of a geometric sequence is given by $u_n = 3(4)^{n-1}, n \in \mathbb{Z}^+$.

(a) Find the common ratio r.

(b) Hence, or otherwise, find S_n, the sum of the first n terms of this sequence.

(5 marks) 2. Consider the arithmetic series $2 + 5 + 8 + \ldots$.

(a) Find an expression for S_n, the sum of the first n terms.

(b) Find the value of n for which $S_n = 1365$.

(5 marks) 3. Find the coefficient of x^3 in the binomial expansion of $\left(1 - \frac{1}{2}x\right)^8$.

(5 marks) 4. Consider the infinite geometric series

$$1 + \left(\frac{2x}{3}\right) + \left(\frac{2x}{3}\right)^2 + \left(\frac{2x}{3}\right)^3 + \cdots .$$

(a) For what value of x does the series converge?

(b) Find the sum of the series if $x = 1.2$.

(3 marks) 5. Solve the following system of linear equations

$$\begin{aligned} x + 3y - 2z &= -6 \\ 2x + y + 3z &= 7 \\ 3x - y + z &= 6. \end{aligned}$$

(5 marks) 6. Find

$$\ln 2 + \ln 2^2 + 3\ln 2 + \ln 4,$$

giving the answer in the form $a \ln 2$, where $a \in \mathbb{Q}$