

1.11 Homework: Series; due Monday 27 October

1. Given a geometric sequence with $u_1 = 3$ and $r = 2.25$
 - (a) Find u_5 .
 - (b) Find S_5 , the sum of the first five terms of the sequence.
 - (c) $S_k = 7980$. Find k algebraically.

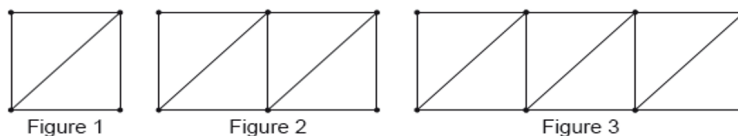
2. In an arithmetic sequence, the first term is 3 and the second term is 7.
 - (a) Find the common difference. [2 marks]
 - (b) Find the tenth term. [2 marks]
 - (c) Find the sum of the first ten terms of the sequence. [2 marks]

3. The first three terms of an arithmetic sequence are $u_1 = 0.3, u_2 = 1.5, u_3 = 2.7$.
 - (a) Find the common difference. [2 marks]
 - (b) Find the 30th term of the sequence. [2 marks]
 - (c) Find the sum of the first 30 terms. [2 marks]

4. The first three terms of a geometric sequence are $u_1 = 0.64, u_2 = 1.6, u_3 = 4$.
 - (a) Find the value of r . [2 marks]
 - (b) Find the value of S_6 . [2 marks]
 - (c) Find the least value of n such that $S_n > 75,000$. [3 marks]

5. Consider a geometric sequence where the first term is 768 and the second term is 576.
Find the least value of n such that the n th term of the sequence is less than 7. [6 mks]

6. Consider the following sequence of figures.



- (a) Figure 1 contains 5 line segments.
Given that Figure n contains 801 line segments, show that $n = 200$. [3 marks]
- (b) Find the total number of line segments in the first 200 figures. [3 marks]

Sequences and series with logarithms

7. The first three terms of a geometric sequence are $\ln x^{16}, \ln x^8, \ln x^4$, for $x > 0$.
- (a) Find the common ratio. [3 marks]
- (b) Solve $\sum_{k=1}^{\infty} 2^{5-k} \ln x = 64$. [5 marks]
8. An arithmetic sequence has the first term $\ln a$ and a common difference $\ln 3$.
The 13th term in the sequence is $8 \ln 9$. Find the value of a . [6 marks]
9. The first two terms of an infinite geometric sequence, in order, are $2 \log_2 x, \log_2 x$ where $x > 0$.
- (a) Find r . [2 marks]
- (b) Show that the sum of the infinite sequence is $4 \log_2 x$. [2 marks]
- (c) The first three terms of an arithmetic sequence, in order, are $\log_2 x, \log_2(\frac{x}{2}), \log_2(\frac{x}{4})$, where $x > 0$.
Find d , giving your answer as an integer. [4 marks]
- (d) Let S_{12} be the sum of the first 12 terms of the arithmetic sequence.
Show that $S_{12} = 12 \log_2 x - 66$. [2 marks]
- (e) Given that S_{12} is equal to half the sum of the infinite geometric sequence, find x ,
giving your answer in the form 2^p , where $p \in \mathbb{Q}$. [3 marks]