1. For each sequence below,
i) classify it as arithmetic, geometric, or neither,
ii) find a function $a(n)$ that describes the sequence,
iii) determine the limit of the sequence

(a) \{2^{1/2}, 2, 2^{3/2}, 4, \ldots \}
(b) \{-27, 9, -3, 1, -\frac{1}{3}, \ldots \}
(c) \{3, \frac{7}{2}, 4, \frac{9}{2}, 5, \ldots \}
(d) \{-7, -2, 3, 8, 13, \ldots \}
(e) \{\frac{5}{4}, -\frac{5}{2}, 5, -10, \ldots \}
(f) \{k - 3, k - 7, k - 11, k - 15, k - 19, \ldots \} where $k$ is any real number

2. Consider a sequence whose 3rd term is 13 and whose 7th term is 208.
   (a) Assume the sequence is arithmetic. Find the generating function $a(n)$ that describes the sequence and find the 19th term.
   (b) Assume the sequence is geometric. Find the generating function $a(n)$ that describes the sequence and find the 19th term.

3. Consider the infinite sequence \{\frac{3k^3}{2}, \frac{9k^4}{4}, \frac{27k^5}{8}, \frac{81k^6}{16}, \ldots \}
   (a) Determine the function that generates this geometric sequence
   (b) Determine the limit of this sequence. (Your answer will depend on the constant $k$.)

4. Prove that the following sequences are neither arithmetic or geometric. Then find the next 4 terms of each sequence assuming the simplest pattern continues.
   (a) \{2, 4, 7, 11, 16, \ldots \}
   (b) \{125, 25, 50, 10, 20, \ldots \}
   (c) \{2, 6, 4, 9, 6, 12, \ldots \}

5. Let $\{a_n\}$ and $\{b_n\}$ be convergent sequences where $\lim_{n \to \infty} a_n = c^2 - 1$, $\lim_{n \to \infty} b_n = c + 1$. For the following sequences,
   i) determine what is required for the new sequence to exist
assume the sequence exists and compute the limit of the sequence, if it exists. Fully
simplify this expression.

(a) \( \{c^2b_n - a_nb_n\} \)
(b) \( \{\frac{b_n}{a_n + b_n}\} \)

6. (a) Calculate the missing terms of the arithmetic sequence with \( a_1 = 18 \) and \( a_6 = 48 \).
(b) Find \( a_1 \) of the arithmetic sequence with \( a_4 = 0 \) and \( a_{10} = 36 \).

7. The sum of the first and third terms of a geometric sequence is 20 and the sum of the first
3 terms is 28. What is the 6th term of the sequence?

8. The seventh term of a geometric sequence is 11 and the eleventh term is 7. What is the
ninth term of this sequence?