Infinite geometric sums and convergence

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. Find $12 + 3 + 3/4 + \cdots$ to infinity. [2 marks]

$12/(1 - 1/4) = 16$.

Answer: 16.

2. Find the infinite sum for $a = 5, r = -0.6$. [2 marks]

$5/(1 + 0.6) = 3.125$.

Answer: $25/8 = 3.125$.

3. A geometric series starts at 8 and sums to 20. Find its ratio. [2 marks]

$8/(1 - r) = 20$ gives $r = 3/5$.

Answer: 3/5.

4. Use partial sums to explain why $1 - 1 + 1 - 1 + \cdots$ does not converge. [2 marks]

They do not approach one value.

Answer: Partial sums alternate between 1 and 0.

5. A ball falls 2 m and rebounds to half its preceding height each time. Find the ideal total vertical distance. [3 marks]

The first fall is 2 m; later paired journeys total $2(1 + 1/2 + \cdots) = 4$ m.

Answer: 6 m.

6. For $10 + 5 + 2.5 + \cdots$, find the tail after four terms. [2 marks]

The fifth term is $10(1/2)^4 = 5/8$; its tail sums to $(5/8)/(1/2) = 5/4$.

Answer: 1.25.