Divergence and Convergence

Sum to Infinity

Quickfire Examples: Calculate a, r and $S\_{\infty }$for the following sequences

1. $1,\frac{1}{2},\frac{1}{4},\frac{1}{8},…$

2. $27,-9,3,-1,…$

3. $p, p^{2},p^{3},p^{4},…$ $where -1<p<1$

4. $p, 1,\frac{1}{p},\frac{1}{p^{2}},…$

Examples

1. The fourth term of a geometric series is 1.08 and the seventh term is 0.23328.

1. Show that this series is convergent.
2. Find the sum to infinity of this series.

2. For a geometric series with first term $a$ and common ratio $r$, $S\_{4}=15$ and $S\_{\infty }=16$.

a) Find the possible values of $r$.

b) Given that all the terms in the series are positive, find the value of $a$.

Test Your Understanding



Extension

1. [MAT 2006 1H] How many solutions does the equation

$$2=\sin(x)+sin^{2}x+sin^{3}x+sin^{4}x+…$$

have in the range $0\leq x<2π$

2. [MAT 2003 1F] Two players take turns to throw a fair six-sided die until one of them scores a six. What is the probability that the first player to throw the die is the first to score a six?

3. [Frost] Determine the value of $x$ where:

$$x=\frac{1}{1}+\frac{2}{2}+\frac{3}{4}+\frac{4}{8}+\frac{5}{16}+\frac{6}{32}+…$$

(Hint: Use an approach similar to proof of geometric $S\_{n}$ formula)

Ex 3E Pg 75