1.5 Infinite Geometric Series

Infinite Geometric Series

Example: $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+...$

Idea of Partial Sum

add the first two terms, the first three terms, and so on.

$S_1 = \frac{1}{2}$

$S_2 =$

$S_3 =$

$S_4 =$

Are the partial sums approaching a particular value? Confirm answer using the formula.

Convergent Geometric Series:

- a series with an infinite number of terms, in which the sequence of partial sums approaches a fixed value
- occurs when $-1 < r < 1$

Divergent Geometric Series:

- a series with an infinite number of terms, in which the sequence of paritial sums does not approach a fixed number

Distinguish between a convergent and divergent series

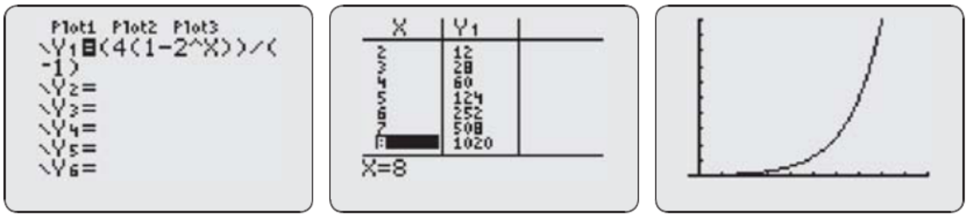
Geometric Series	Ratio (r)	Partial Sum	Convergent/ Divergent
2+4+8+16....			
$\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+...$			
-1+1+-1+1+...			
1+1+1+1+...			

If the partial sums **approach a particular value** as the number of terms get larger, the series is convergent.

If the partial sums **do not approach a particular value** the series is divergent.

Example: Consider the series: 4 + 8 + 16 + 32 + . . .

$S_1 = 4$
$S_2 = 12$
$S_3 = 28$
$S_4 = 60$
$S_5 = 124$



As the number of terms increases, the sum of the series ______________

Example: Consider the series: $\frac{3}{2}+\frac{3}{4}+\frac{3}{8}+\frac{3}{16}+\ldots$

$S_1 =$

$S_2 =$

$S_3 =$

$S_4 =$

As the number of terms increases, the sum of the series approaches ____ ?

Infinite Geometric Series:

$S_\infty = \frac{t_1}{1-r}$, where -1 < r < 1

Example 2: Your Turn

Determine whether each infinite geometric series converges or diverges.

Calculate the sum, if it exists. **a)** $1 + \frac{1}{5} + \frac{1}{25} + ...$ **b)** $4 + 8 + 16 + ...$

Example 3: Your Turn

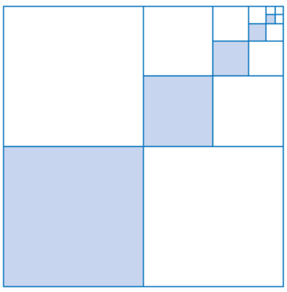
You can express $0.\overline{584}$ as an infinite geometricseries.
$0.\overline{584}$ = 0.584 584 584 . . .
= 0.584 + 0.000 584 + 0.000 000 584 + …
Determine the sum of the series.

Example 4: **Apply the Sum of an Infinite Geometric Series**

Assume that each shaded square represents $\frac{1}{4}$ of the area of the larger square bordering two of its adjacent sides and that the shading continues indefinitely in the indicated manner.

a) Write the series of terms that would represent this situation.

b) How much of the total area of the largest square is shaded?



Key Ideas p. 63

Assign p.63-65

1(b), 2(abd), 3(a), 4, 5(ac), 6, 7, 8, 9, 12, 13, 15, 17, 22