U1:L5 Infinite Geometric Series

Consider: ... "elipses"

$r = \div 2 = \times 0.5$ $4, 2, 1, 0.5, 0.25 \ldots$

S_4	S_5	S_6	S_7	S_8
7.5	7.75	0.125 7.875	0.0625 7.9375	0.03125 7.96875

As the number of terms increases, the sum gets closer and closer to 8.

This is said to be a convergent series.

Consider: $r = 2$ $\times 2$ $4, 8, 16, 32 \ldots 64$

S_1	S_2	S_3	S_4	S_5
4	12	28	60	124

As the number of terms increases, the sum continues to grow.

This series does not approach a Fixed Sum. Therefore, the sum of this series cannot be calculated.

It is a divergent series.

The formula for an Infinite Geometric Series ...

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

EXAMPLE:

I the sequence convergent or divergent? If possible, find the sum of the series…

a) $1, -\frac{1}{3}, \frac{1}{9} \ldots$

$t_1 = 1$

$r = \div 3 = \times \frac{-1}{3}$

$-1 < r < 1$

then = convergent

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

$S_\infty = \frac{1}{1-(\frac{-1}{3})}$

$S_\infty = \frac{1}{1+\frac{1}{3}} = \frac{1}{\frac{4}{3}}$

$S_\infty = 1 \div \frac{4}{3} = \frac{1}{1} \div \frac{4}{3}$

$S_\infty = \frac{1}{1} \times \frac{3}{4}$

$S_\infty = \frac{3}{4}$

b) $2, -4, 8 \ldots$

$t_1 = 2$

$r = -2$

divergent

$r < -1$

∴ cannot find sum

PRACTICE! Pages 63 – 65 (Q 1,3,5,7)