

C11 - 1.5 - Infinite Geometric Sequences Notes

8, 4, 2 ... $s_{\infty} = ?$

What is the sum of the infinite sequence?

$$\begin{array}{cccccc} \times \frac{1}{2} & & \times \frac{1}{2} & & & \\ \curvearrowright & & \curvearrowright & & & \\ \frac{8}{t_1}, & \frac{4}{t_2}, & \frac{2}{t_3}, & \frac{1}{t_4}, & \frac{1}{2}, & \frac{1}{4}, \dots \\ & & & & t_5 & t_6 \end{array}$$

$$t_1 = 8$$

$$r = \frac{t_n}{t_{n-1}}$$

$$r = \frac{4}{8}$$

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

$$r = \frac{t_n}{t_{n-1}}$$

$$r = \frac{2}{4}$$

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

$$-1 < r < 1$$

$$-1 < \frac{1}{2} < 1$$

\therefore Convergent, has sum

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

$$s_{\infty} = \frac{8}{1-\frac{1}{2}}$$

$$s_{\infty} = \frac{8}{\frac{1}{2}}$$

$$s_{\infty} = 16$$

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

Sum of "n" terms formula (infinite number of terms)

Check your answer: $8 + 4 + 2 + 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} = 15.9375 \approx 16$ ✓

8, 16, 32 ... $s_{\infty} = ?$

What is the sum of the infinite sequence?

$$\begin{array}{cccccc} \times 2 & & \times 2 & & & \\ \curvearrowright & & \curvearrowright & & & \\ \frac{8}{t_1}, & \frac{16}{t_2}, & \frac{32}{t_3}, & \frac{64}{t_4}, & \frac{128}{t_5}, & \frac{256}{t_6}, \dots \end{array}$$

$$t_1 = 8$$

$$r = \frac{t_n}{t_{n-1}}$$

$$r = \frac{16}{8}$$

$$r = 2$$

$$r = \frac{t_n}{t_{n-1}}$$

$$r = \frac{32}{16}$$

$$r = 2$$

$$r > 1$$

\therefore Divergent

\therefore No sum

Check your answer: $8 + 16 + 64 + 128 + 256 + 512 + 1024 + 2048 + \dots = \infty$ ✓