C11 - 1.4 - Geometric Series Notes

3,6,12 …

$s_8 = ?$ $s_\infty = ?$

$\boxed{s_n = sum\ of\ n\ terms}$

$\times 2$ $\times 2$

$3, 6, 12, ?, \ldots 384$

$t_1, t_2, t_3, t_4, t_{10}$

$n = 1 \quad n = 2 \quad n = 3 \quad n = 4 \quad n = 8$

$t_1 = 3$

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

$r = \frac{6}{3}$ $r = \frac{12}{6}$

$r = 2$ $r = 2$

What is the sum of the first eight terms s_8? $s_8 = ?, n = 8$.

$s_n = \frac{t_1(1-r^n)}{1-r}$

$\boxed{s_n = \frac{t_1(1-r^n)}{1-r}}$

Sum of "n" terms formula (if number of terms is known)

$s_8 = \frac{3(1-2^8)}{1-2}$

$s_8 = 765$

Check your answer: $3 + 6 + 12 + 24 + 48 + 96 + 192 + 384 = 765$ ✓

OR

$s_n = \frac{t_1 - rt_n}{1-r}$

$s_8 = \frac{3-2(t_8)}{1-2}$

$s_8 = \frac{3-2(384)}{1-2}$ ←

$s_8 = 756$

$t_n = 3(2)^{n-1}$

$t_8 = 3(2)^{8-1}$

$t_8 = 3(2)^7$

$t_8 = 3(128)$

$t_8 = 384$

$\boxed{s_n = \frac{t_1 - rt_n}{1-r}}$

Sum of "n" terms formula (if last term t_n is known)

What is the sum of an infinite number of terms?

$r = 2$ $r > 1, \therefore no\ sum$

Check your answer: $3 + 6 + 12 + 24 + 48 + 96 + 192 + 384 + 768 + 1536 + 3072 + \cdots = \infty$ ✓