Questions from Homework

Geometric Sequences

Ex: 2, 4, 8, 16, 32

Sequences of numbers that follow a pattern of multiplying a fixed number from one term to the next are called geometric sequences.

- To find the next term, multiply the previous term by a common ratio.
- In the sequence 2, 4, 8, 16, 32 we are multiplying by 2.
- This common ratio is called **"r" ($r = t_2/t_1$).**
- The first term is still called **"a"** or **"t_1".**
- The second term is called **"t_2".**
- The last term or an indicated term is called **"t_n".**
- The position of a term or the number of terms is called **"n".**

Geometric Sequences

Remember $r = t_2/t_1$

Find "r" and the next term!

1, 2, 4, 8,..., 16

$r = \frac{2}{1} = \frac{4}{2} = \frac{8}{4} = 2$

16, -8, 4, -2, 1,..., $-\frac{1}{2}$

$r = \frac{-8}{16} = \frac{4}{-8} = \frac{-2}{4} = \frac{1}{-2} = -\frac{1}{2}$

0.01, 0.06, 0.36, 2.16, ..., 12.96

$r = \frac{0.06}{0.01} = \frac{0.36}{0.06} = \frac{2.16}{0.36} = 6$

Geometric Sequences

To find any given term in a geometric sequence we use the following formula:

$$t_n = ar^{n-1}$$

Examples

Find the indicated term

1. 3, 6, 12... t_7

2. $2, -1, \frac{1}{2}, \frac{-1}{4}\ldots$

t_9

We can also determine the number of terms in the sequence.

$$t_n = ar^{n-1}$$

How many terms are in the following sequences?
(Solve for "n")

$9, 27, 81, \ldots 2187$

$a = 9$

$r = 3$

$t_n = 2187$

$\frac{2187}{9} = \frac{(9)(3)^{n-1}}{9}$

$243 = (3)^{n-1}$

$(3)^5 = (3)^{n-1}$

$5 = n-1$

$6 = n$

$\frac{\log 243}{\log 3} = 5$

$\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots \frac{1}{1024}$

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

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

$t_n = \frac{1}{1024}$

$\frac{\frac{1}{1024}}{\frac{1}{2}} = \frac{\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^{n-1}}{\frac{1}{2}}$

$\frac{1}{512} = \left(\frac{1}{2}\right)^{n-1}$

$\left(\frac{1}{2}\right)^9 = \left(\frac{1}{2}\right)^{n-1}$

$9 = n-1$

$10 = n$

$\frac{\log\left(\frac{1}{512}\right)}{\log\left(\frac{1}{2}\right)} = 9$

$t_n = ar^{n-1}$

Find "a", "r", and "t_n" for the following sequences!

$t_2 = 12,\ t_5 = 768$

$t_2 = ar^{2-1}$ | $t_5 = ar^{5-1}$

$t_2 = ar^1$ | $t_5 = ar^4$

$12 = ar^1$ | $768 = ar^4$

$ar = 12$ | $ar^4 = 768$

$\frac{ar^4 = 768}{ar = 12}$

$r^3 = 64$

$r = 4$

$ar = 12$

$a(4) = 12$

$a = 3$

$t_n = ar^{n-1}$

$t_n = (3)(4)^{n-1}$

$t_3 = 64,\ t_7 = 4$

Homework

#1- #6

② d) $\partial^{50}, \partial^{48}, \partial^{46}$

$a = \partial^{50}$

$r = \frac{\partial^{48}}{\partial^{50}} = \frac{\partial^{46}}{\partial^{48}} = \partial^{-2}$

$t_{15} = ?$

$t_{15} = (\partial^{50})(\partial^{-2})^{15-1}$

$= (\partial^{50})(\partial^{-2})^{14}$

$= (\partial^{50})(\partial^{-28})$

$= \partial^{22}$

② e) $\frac{p^2}{q}, \frac{p^3}{2q}, \frac{p^4}{4q}, \ldots$

$a = \frac{p^2}{q}$

$r = \frac{p^3}{2q} \div \frac{p^2}{q}$

$= \frac{p^3}{2q} \times \frac{q}{p^2}$

$= \frac{p}{2}$

$t_{10} = \left(\frac{p^2}{q}\right)\left(\frac{p}{2}\right)^{10-1}$

$= \left(\frac{p^2}{q}\right)\left(\frac{p}{2}\right)^{9}$

$= \left(\frac{p^2}{q}\right)\left(\frac{p^9}{512}\right)$

$= \frac{p^{11}}{512q}$

② f) $\sqrt{3}, \sqrt{6}, 2\sqrt{3}, \ldots$

$t_9 = ?$

$a = \sqrt{3}$

$r = \sqrt{2}$