BE - PRECALC THURSDAY 1-14-10

Find the next 3 terms of each sequence, how did you find them?

① $\frac{2}{3}, 4, 24, \ldots$

② $2, 3, \frac{9}{2}, \ldots$

③ $1, -\frac{1}{2}, \frac{1}{4}, \ldots$

A geometric sequence is a sequence where every term after a_1 is the product of the preceding term and the common ratio r.

In a geometric sequence you can find the common ratio by dividing any two consecutive terms: $\frac{a_N}{a_{N-1}} = r$

① $\frac{2}{3}, 4, 24, \ldots$ $\quad r = \frac{24}{4} = 6$

CK: $\frac{2}{3} \cdot 6 = 4$ ✓ , $4 \cdot 6 = 24$ ✓

Next 3 terms ⇒ 144, 864, 5184...

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② $2, 3, \frac{9}{2}, \ldots$ $\quad r = \frac{3}{2}$

CK: $2 \cdot \frac{3}{2} = 3$ ✓ , $3 \cdot \frac{3}{2} = \frac{9}{2}$ ✓

NEXT 3 terms ⇒ $\frac{27}{4}, \frac{81}{8}, \frac{243}{16}, \ldots$

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③ $1, -\frac{1}{2}, \frac{1}{4}, \ldots$ $\quad r = \frac{-\frac{1}{2}}{1} = -\frac{1}{2}$

Next 3 terms ⇒ $-\frac{1}{8}, \frac{1}{16}, -\frac{1}{32} \ldots$

Geometric Sequence Formula:

$$a_N = a_1 r^{N-1}$$

Geometric Series Formula:

$$S_N = \frac{a_1 - a_1 r^N}{1 - r}$$

(Ex) Find 10^{th} term and S_{10} for

$1, -\frac{1}{2}, \frac{1}{4}, \ldots \quad r = -\frac{1}{2} \quad a_1 = 1$

$$a_{10} = (1)\left(-\frac{1}{2}\right)^{10-1} = \left(-\frac{1}{2}\right)^9 = -\frac{1}{512}$$

$$S_{10} = \frac{1 - (1)\left(-\frac{1}{2}\right)^{10}}{1 - \left(-\frac{1}{2}\right)} = \frac{1 - \left(-\frac{1}{2}\right)^{10}}{\frac{3}{2}}$$

$$= \frac{1 - \frac{1}{1024}}{\frac{3}{2}}$$

$$= \frac{2^{1}}{\frac{3}{1}} \cdot \frac{1023^{341}}{1024_{512}} = \boxed{\frac{341}{512}}$$

Homework / Classwork:

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