8-3 Geometric Sequences and Series
Day 1
Skip 84 and 86

Geometric Sequence: consecutive terms of this sequence have a common ratio "r".

Ex 1) 12, 36, 108, 324, ... r = 3

$36 \div 12 = 3$
$324 \div 108 = 3$

Ex 2) $-\frac{1}{3}$, $\frac{1}{9}$, $-\frac{1}{27}$, $\frac{1}{81}$, ...

$\frac{1}{9} \div -\frac{1}{3} = \frac{1}{9} \cdot -\frac{3}{1} = -\frac{3}{9} = -\frac{1}{3} = r$

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nth term of a geometric sequence: $a_n = a_1 r^{n-1}$

Ex 3) Write the first 5 terms of the geometric sequence if $a_1 = 3$ and r = 2.

$a_2 \Rightarrow a_2 = 3 \cdot 2^{2-1} = 3 \cdot 2^1 = 6$

$3, 6, 12, 24, 48$
*2 *2 *2 *2

Ex 4) Find the 15th term of a geometric sequence whose first term is 20 and whose common ratio is 1.05.

$a_1 = 20$
$r = 1.05$

$a_{15} = 20 \cdot 1.05^{15-1}$ 39.599

Find the sum...there is a formula given, but we are using the graphing calculator :)

Ex 5) $\sum_{n=0}^{15} 2 \left(\frac{4}{3}\right)^n =$ sum(seq($2 * 1.3^x$, x, 0, 15))

≈ 592.647

Use summation to notation to write the sum.

Ex 6) $5 + 15 + 45 + \ldots + \cancel{3645}$

$\overset{3645}{\cancel{\ }}$

$$\sum_{n=1}^{7} 5 \cdot 3^{n-1}$$

$a_1 = 5$

$r = 15 \div 5 = 3$

$a_n = a_1 \cdot r^{n-1}$

$3645 = 5 \cdot 3^{n-1}$

$\dfrac{3645}{5} = \dfrac{5 \cdot 3^{n-1}}{5}$

$729 = 3^{n-1}$

$3^6 = 3^{n-1}$

$6 = n-1$

$7 = n$

Ex7) $2 - \dfrac{1}{2} + \dfrac{1}{8} + \ldots, + \dfrac{1}{2048}$

$$\sum_{n=1}^{7} 2 \cdot -\dfrac{1}{4}^{\,n-1}$$

$a_1 = 2$

$r = -\dfrac{1}{2} \div 2$

$= -\dfrac{1}{2} \cdot \dfrac{1}{2} = -\dfrac{1}{4}$

$a_n = a_1 \cdot r^{n-1}$

$\dfrac{1}{2048} = 2 \cdot -\dfrac{1}{4}^{\,n-1}$

$\dfrac{\frac{1}{2048}}{2} = \dfrac{2 \cdot -\frac{1}{4}^{\,n-1}}{2}$

$\dfrac{1}{4096} = -\dfrac{1}{4}^{\,n-1}$

$\dfrac{1}{4096} = \dfrac{1}{4}^{\,n-1}$

$4^{-6} = (4^{-1})^{n-1}$

$4^{-6} = 4^{-n+1}$

$-6 = -n+1$

$-7 = -n$

$7 = n$