Name: Answer key Per: _____ Date: _____

Serafino ▪ Algebra 2E

Sum of a converging, infinite geometric series

$$S_\infty = \frac{a_1}{1-r}$$

Where $-1 < r < 1$

8D2 INFINITE Geometric Series

Classwork/Homework

An infinite geometric series will have a sum if it is convergent.

Classify the following as convergent or divergent. * the |#'s| are getting SMALLER

$|r|<1$ $|r|>1$

Find the sum... save the world

1) $a_1 = -3,\ r = 4$

divergent

2) $a_1 = 4,\ r = -\frac{3}{4}$

convergent

3) $a_1 = 5.5,\ r = 0.5$

convergent

4) $a_1 = -1,\ r = 3$

divergent

5) $81 + 27 + 9 + 3...,$

convergent

6) $7.1 + 17.75 + 44.375 + 110.9375...,$

divergent

7) $-3 + \frac{12}{5} - \frac{48}{25} + \frac{192}{125}...,$

convergent

8) $\frac{128}{3125} - \frac{64}{625} + \frac{32}{125} - \frac{16}{25}...,$

divergent

9) $\sum_{k=1}^{\infty} -4^{k-1}$

divergent

10) $\sum_{k=1}^{\infty} \frac{16}{9}\left(\frac{3}{2}\right)^{k-1}$

divergent

11) $\sum_{i=1}^{\infty} 4.2 \cdot 0.2^{i-1}$

convergent

12) $\sum_{k=1}^{\infty} \frac{7}{6}\left(-\frac{1}{4}\right)^{k-1}$

convergent

Sum of a converging, infinite geometric series

$$S_\infty = \frac{a_1}{1-r}$$

Where $-1 < r < 1$

Evaluate the infinite series of the series, if one exists.

13) $a_1 = 3,\ r = -\frac{1}{5}$ $S_\infty = \frac{3}{1-(-\frac{1}{5})}$ $= \frac{15}{2}$

14) $a_1 = 1,\ r = -4$ no sum

15) $a_1 = 1,\ r = -3$ no sum!

16) $a_1 = 1,\ r = \frac{1}{2}$ $S_\infty = \frac{1}{1-(\frac{1}{2})} = 2$

17) $1 + 0.5 + 0.25 + 0.125...,$ $S_\infty = \frac{1}{1-(\frac{1}{2})} = 2$

18) $3 - \frac{9}{4} + \frac{27}{16} - \frac{81}{64}...,$ $S_\infty = \frac{3}{1-(\frac{3}{4})} = \frac{12}{7}$

19) $81 - 27 + 9 - 3...,$ $S_\infty = \frac{81}{1-(-\frac{1}{3})} = \frac{243}{4}$

20) $1 - 0.6 + 0.36 - 0.216...,$ $S_\infty = \frac{1}{1-(-.6)} = 0.625$

21) $\sum_{k=1}^{\infty} 5 \cdot \left(-\frac{1}{5}\right)^{k-1}$ $S_\infty = \frac{5}{1-(-\frac{1}{5})} = \frac{25}{6}$

22) $\sum_{n=1}^{\infty} -6 \cdot \left(-\frac{1}{2}\right)^{n-1}$ $S_\infty = \frac{-6}{1-(-\frac{1}{2})} = -4$

23) $\sum_{i=1}^{\infty} \left(\frac{1}{3}\right)^{i-1}$ $S_\infty = \frac{1}{1-(\frac{1}{3})} = \frac{3}{2}$

24) $\sum_{k=1}^{\infty} 4^{k-1}$ no sum

Determine the common ratio:

25) $a_1 = 1,\ S = 1.25$ $1.25 = \frac{1}{1-r}$ $1.25 - 1.25r = 1$ $-1.25r = -.25$ $r = 0.2$

26) $a_1 = 96,\ S = 64$ $64 = \frac{96}{1-r}$ $1-r = \frac{96}{64}$ $r = -\frac{1}{2}$

27) $a_1 = -4,\ S = -\frac{16}{5}$ $\frac{-16}{5} = \frac{-4}{1-r}$ $-16 + 16r = -20$ $16r = -4$ $r = -\frac{1}{4}$

28) $a_1 = 1,\ S = 2.5$ $2.5 = \frac{1}{1-r}$ $1-r = \frac{1}{2.5}$ $r = 0.6$