LESSON 6.4 Skills Practice

Name _____ Date _____

These Series Just Go On . . . And On . . . And On . . .

Infinite Geometric Series

Vocabulary

Describe how the key terms are similar and how they are dissimilar.

1. convergent series

   divergent series

Problem Set

Determine whether each geometric series is convergent or divergent. Explain your reasoning.

1. $\frac{1}{5} + \frac{1}{25} + \frac{1}{125} + \cdots$

   $r = \frac{1}{5}$

   The series is convergent because the common ratio is between 0 and 1.

2. $\frac{5}{7} + \frac{10}{21} + \frac{20}{63} + \cdots$

3. $\frac{2}{5} + \frac{8}{15} + \frac{32}{45} \cdots$

4. $0.3 + 0.9 + 2.7 + \cdots$

5. $\sum_{i=1}^{\infty} \frac{2^i}{7}$

6. $\sum_{i=0}^{\infty} 100(0.1)^i$

7. $\frac{1}{50}\sum_{i=1}^{\infty}(4)^i$

8. $\frac{3}{2}\left[1+\left(\frac{1}{3}\right)^1+\left(\frac{1}{3}\right)^2+\left(\frac{1}{3}\right)^3+\cdots\right]$

9. $1+\left(\frac{8}{3}\right)^1+\left(\frac{8}{3}\right)^2+\left(\frac{8}{3}\right)^3+\cdots$

10. $\sum_{i=0}^{\infty}(6^{-1})^i$

Determine whether each geometric series is convergent or divergent. If the series is convergent, compute the series.

11. $\frac{2}{3}+\frac{2}{9}+\frac{2}{27}+\cdots$

$r=\frac{1}{3}$; The series is convergent.

$S=\frac{g_1}{1-r}$

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

$S=1$

12. $\frac{1}{10}+\frac{3}{20}+\frac{9}{40}+\cdots$

13. $1.05+2.1+4.2+\cdots$

14. $17+1.7+0.17+\cdots$

6

Name _____ Date _____

15. $\sum_{i=1}^{\infty} \frac{7}{5}\left(\frac{1}{5}\right)^{i-1}$

16. $32\sum_{i=1}^{\infty}(1.01)^{i}$

17. $\sum_{i=1}^{\infty} \frac{1}{4^{i}}$

18. $\left(\frac{1}{2}\right)^{-1} + \left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{2}\right)^{-3} + \cdots$

19. $12\left[1 + \left(\frac{5}{3}\right)^{2} + \left(\frac{5}{3}\right)^{3} + \cdots\right]$

20. $12\left[1 + \left(\frac{2}{3}\right)^{2} + \left(\frac{2}{3}\right)^{3} + \cdots\right]$

LESSON 6.4 Skills Practice

Identify which formula should be used for each type of series, and then compute each series.

Formula for the first n terms of an arithmetic series: $S_n = \frac{n(a_1 + a_n)}{2}$

Formula for the first n terms of a geometric series: $S_n = \frac{g_1(r^n - 1)}{r - 1}$ or $\frac{g_n \cdot r - g_1}{r - 1}$

Formula for an infinite convergent geometric series: $S = \frac{g_1}{1 - r}$

Formula for an infinite divergent geometric series: S = infinity

21. $\frac{2}{9} + \frac{2}{27} + \frac{2}{81} + \frac{2}{243}$

$r = \frac{1}{3}$

The geometric series is finite.

$S_n = \frac{g_n \cdot r - g_1}{r - 1}$

$S_4 = \frac{\frac{2}{243}\left(\frac{1}{3}\right) - \frac{2}{9}}{\frac{1}{3} - 1}$

$S_4 = \frac{80}{243}$

22. $\sum_{i=1}^{\infty} 5\left(\frac{2}{11}\right)^i$

23. $\frac{5}{4} + \frac{25}{16} + \frac{125}{64} + \cdots$

24. $5 + (-1) + (-7) + (-13) + (-19)$

6

Name _____ Date _____

25. $0.3[1 + (0.3)^1 + (0.3)^2 + (0.3)^3 + \cdots]$

26. $1 + 1.1 + 1.21 + 1.331 + 1.4641 + \cdots$

27. $\sum_{n=1}^{7} 2n$

28. $\sum_{i=1}^{5} \left(\frac{1}{8}\right)^{i-1}$