$A = P\left(1 + \frac{r}{n}\right)^{nt}$ $A = Pe^{rt}$

1) A principal of \$1000 is invested at 3% interest. Find the amount after 10 years is the interest is compounded a) annually, b) monthly

$P = 1000$
$r = .03$
$t = 10$

a) annual $\therefore n = 1$

$A = 1000\left(1 + \frac{.03}{1}\right)^{1(10)}$

$A = 1000(1.03)^{10}$

$\approx \$1343.92$

b) monthly $\therefore n = 12$

$A = 1000\left(1 + \frac{.03}{12}\right)^{12(10)}$

$A = 1000(1.0025)^{120}$

$\approx \$1349.35$

2) You go to work for a company that pays \$0.01 the first day, \$0.02 the second day, \$0.04 the third day, and so on. If the daily wage keeps doubling, what will your total income be after working a) 29 days, b) 30 days) c) 31 days ?

$a_1 = .01$
$a_2 = .02$
$a_3 = .04$
$r = 2$

a) 29 days $S_{29} = .01\left(\frac{1-2^{29}}{1-2}\right)$ $\$5,368,709.11$

b) 30 days $S_{30} = .01\left(\frac{1-2^{30}}{1-2}\right)$ $\$10,737,418.23$

c) 31 days $S_{31} = .01\left(\frac{1-2^{31}}{1-2}\right)$ $\$21,474,836.47$

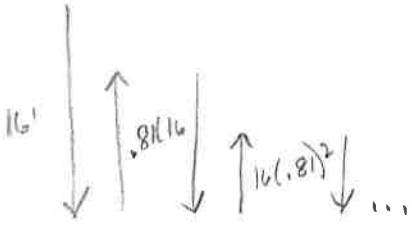
3) Find the rational number representation of the repeating decimal: $0.\overline{297}$

$.297$
$+.000297$
$+.000000297$

$a_1 = .297$
$r = .001$

$S_\infty = \frac{.297}{1-.001} = \frac{11}{37}$

4) A ball is dropped from a height of 16 feet. Each time it drops h feet, it rebounds $0.81\,h$ feet. Find the total vertical distance traveled by the ball.



double them except for 1st.

$16 + 2\sum_{i=1}^{\infty} 12.96(.81)^{n-1}$

$16 + 2\left(\frac{12.96}{1-.81}\right)$

$\approx 152.421'$

HPC Name_____

Geometric Sequence & Series

Date_____

Determine if the sequence is geometric. If it is, find the common ratio, the term named in the problem, and the explicit formula.

1) $5, \frac{5}{2}, \frac{5}{4}, \frac{5}{8}, \ldots$ yes $r = \frac{1}{2}$

Find a_{12}

$a_{12} = a_1\left(\frac{1}{2}\right)^{n-1}$

$a_{12} = 5\left(\frac{1}{2}\right)^{11}$

$\frac{5}{2048}$

2) $-4, -8, -16, -32, \ldots$ yes $r = 2$

Find a_9

$a_9 = -4(2)^{9-1}$

$a_9 = -1024$

3) $-1, 3, -9, 27, \ldots$ yes $r = -3$

Find a_{12}

$a_{12} = (-1)(-3)^{11}$

$a_{12} = 177147$

4) $-96, -48, -24, -12, \ldots$ yes $r = \frac{1}{2}$

Find a_9

$a_9 = -96\left(\frac{1}{2}\right)^8$

$a_9 = \frac{3}{8}$

Given two terms in a geometric sequence find the explicit formula.

5) $a_5 = 512$ and $a_4 = -128$

$a_5 = a_4 r^{5-4}$

$512 = -128r^1$

$-4 = r$

$a_4 = a_1 r^{4-1}$

$-128 = a_1(-4)^3$

$2 = a_1$

$a_n = 2(-4)^{n-1}$

6) $a_2 = 8$ and $a_3 = 32$

$a_3 = a_2 r^{3-2}$

$32 = 8r$

$4 = r$

$a_2 = a_1(4)^{2-1}$

$8 = a_1(4)$

$2 = a_1$

$a_n = 2(4)^{n-1}$

Given two terms in a geometric sequence find the common ratio and the 8th term.

7) $a_2 = -9$ and $a_6 = -729$

$a_6 = a_2 r^{6-2}$

$-729 = -9r^4$

$81 = r^4$

$3 = r$

$a_8 = a_6 (3)^{8-6}$

$a_8 = -729(3)^2$

$a_8 = -6561$

8) $a_6 = 4096$ and $a_3 = 64$

$a_6 = a_3 r^{6-3}$

$4096 = 64r^3$

$64 = r^3$

$4 = r$

$a_8 = a_6 r^{8-6}$

$a_8 = 4096(4)^2$

$a_8 = 65536$

Given a term in a geometric sequence and the common ratio find the 8th term and the explicit formula.

9) $a_3 = 18,\ r = 3$

$a_8 = a_3 (3)^5$

$a_8 = 18(3)^5$

$a_8 = 4374$

$a_3 = a_1 r^{3-1}$

$18 = a_1 (3)^2$

$2 = a_1$

$a_n = 2(3)^{n-1}$

10) $a_6 = -15552,\ r = -6$

$a_8 = a_6 r^{8-6}$

$a_8 = -15552(-6)^2$

$a_8 = -559872$

$a_6 = a_1 r^{6-1}$

$-15552 = a_1 (-6)^5$

$2 = a_1$

$a_n = 2(-6)^{n-1}$

Evaluate the related series of each sequence.

11) $4, \frac{8}{3}, \frac{16}{9}, \frac{32}{27}$

$\frac{260}{27}$

12) $-1, \frac{1}{2}, -\frac{1}{4}, \frac{1}{8}$

$-\frac{5}{8}$

Evaluate each geometric series described.

13) $1 + 2 + 4 + 8..., \ n = 7 \qquad r = 2$

$S_7 = 1\left(\frac{1-(2)^7}{1-2}\right)$

$S_7 = 127$ ✓

14) $1 - 5 + 25 - 125..., \ n = 6 \qquad r = (-5)$

$S_6 = 1\left(\frac{1-(-5)^6}{1-(-5)}\right)$

-2604 ✓

15) $\sum_{i=1}^{8} 6^{i-1}$ $r=6$ $a_1 = 6^{1-1} = 1$

$S_8 = 1\left(\frac{1-6^8}{1-6}\right)$

335923

16) $\sum_{n=1}^{8} (-5)^{n-1}$ $r=-5$ $a_1 = 1$

$S_8 = 1\left(\frac{1-(-5)^8}{1-(-5)}\right)$

-65104

Determine the number of terms *n* in each geometric series.

17) $a_1 = 3,\ r = -6,\ S_n = 119973$

$119973 = 3\left(\frac{1-(-6)^n}{1-(-6)}\right)$

$39991 = \left(\frac{1-(-6)^n}{7}\right)$

$279937 = 1-(-6)^n$

$279936 = -(-6)^n$

$279936 = 6^n$

$n = \frac{\ln 279936}{\ln 6}$

$n = 7$

18) $a_1 = 1,\ r = -6,\ S_n = -185$

$-185 = 1\left(\frac{1-(-6)^n}{1-(-6)}\right)$

$-185 = \left(\frac{1-(-6)^n}{7}\right)$

$-1295 = 1-(-6)^n$

$-1296 = -(-6)^n$

$1296 = (6)^n$

$n = \frac{\ln 1296}{\ln 6}$

$n = 4$

Evaluate each infinite geometric series described.

19) $4+2+1+\frac{1}{2}\ldots$ $r = \frac{1}{2}$

$S_\infty = \frac{4}{1-\frac{1}{2}}$

8

20) $\frac{9375}{1024} - \frac{1875}{256} + \frac{375}{64} - \frac{75}{16}\ldots$ $r = \frac{-4}{5}$

$S_\infty = \frac{\frac{9375}{1024}}{1-\left(\frac{-4}{5}\right)}$

$\frac{15625}{3072}$

Determine the common ratio of the infinite geometric series.

21) $a_1 = -1.9,\ S = -1.1875$

$-1.1875 = \frac{-1.9}{1-r}$

$1-r = \frac{-1.9}{-1.1875}$

$1-r = 1.6$

$-r = .6$

$r = -.6$

22) $a_1 = 3.2,\ S = 4$

$4 = \frac{3.2}{1-r}$

$1-r = \frac{3.2}{4}$

$1-r = .8$

$-r = -.2$

$r = .2$