HW 11-4

1) 19,680 2) 39.375 3) 1,705

4) (1)

5) (4) 6) 19,171

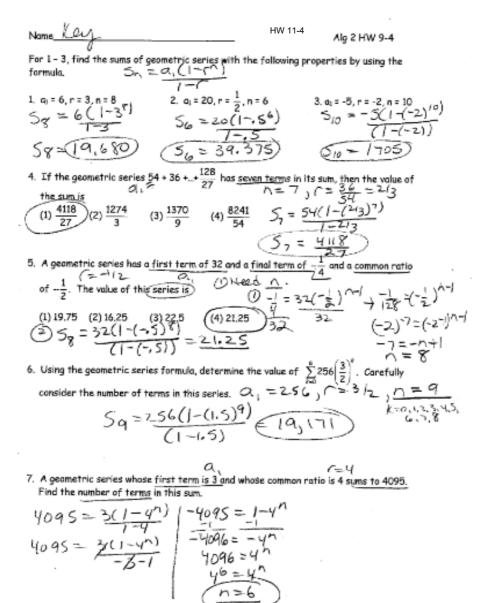
7)6

8) 
$$\frac{29,524}{729}$$

9) \$10,737,418.23

10) 2,778

11)63



27+9+3\*...
$$\frac{1}{729}$$
 3 = (3') \( \frac{1}{3} \) \( \frac{1}{3} \) \( \frac{1}{3} \) \( \frac{1}{729} \) \( \frac{1}{3} \) \( \frac{1}{3} \) \( \frac{1}{729} \) \( \frac{1

## Geometric Modeling Applications

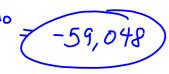
Day 5

Warm-up:

1. In a geometric sequence, the first term is -2 and the common ratio is 3. Find the sum of the first 10

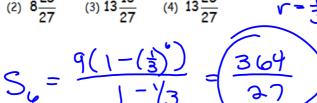
a=-2 r=3 n=10





- 2. Find the sum of the geometric series:  $9+3+1+3...+\frac{1}{27}$

- (1)  $8\frac{13}{27}$  (2)  $8\frac{25}{27}$  (3)  $13\frac{13}{27}$  (4)  $13\frac{25}{27}$



## Modeling Examples

1. A culture of bacteria is growing at a rate of 8% per day. If there are 150 bacteria in the initial population, approximately how many bacteria. to the negreet bacteria.

$$r = 1.08$$
  
 $a_1 = 150$   
 $n = 7 \times 7 = 49$ days

% per day. If there are 150 bacteria in-the initial the nearest bacteria, will there be in 7 weeks?

$$Q_{n} = Q_{1} r^{n-1}$$

$$Q_{49} = 150(1.08) = 6031.586$$

$$(6032 baderia)$$

2. Devin began running a month ago to get back in shape. The first day he ran .5 miles. Each day after that, he ran 10% more than the previous day for a total of 30 days. Use the formula for the sum of a finite geometric series to calculate the total distance Devin ran over the 30 days. Round to the nearest thousandth of a mile.

$$a_{1}=.5$$
  
 $r=1.10$   
 $n=30$ 

$$S_{30} = \frac{.5(1-1.1^{30})}{1-1.1} - 82.247 \text{mi}$$

3. Taylor earns \$35,000 in her first year of teaching and earns 4% increase in each successive year. Write a geometric series formula,  $S_n$ , for Taylor's total earnings over n years. Then find Taylor's total earnings to the nearest dollar at the end of 10 years of teaching.

$$q_1 = 35,000$$
 ()  $S_n = \frac{35,000(1-1.04^n)}{1-1.04}$ 

$$(3) S_{10} = \frac{35,000(1-1.04^{10})}{1-1.04}$$

$$= \frac{35,000(1-1.04^{10})}{1-0.04}$$

4. Monthly mortgage payments can be calculated according to the formula,  $A = \frac{Mp^{rt}(1-p)}{(1-p^{rt})}$  where M is

the size of the mortgage, n is the number of compounds per year, t is the length of the mortgage, in years,

and 
$$p = \left(1 + \frac{r}{n}\right)$$
 where r is the interest rate as a decimal. What would the monthly mortgage payments be on \$175,000, 15 year mortgage with 6% interest, compounded monthly, to the

nearest dollar.

$$P = 1 + \frac{.06}{12} = 1.005 \rightarrow X$$

$$A = \frac{175,000 \times (1-X)}{1-12(15)}$$