Name_____

Precalculus Unit 12: Review
12.1-12.5

Use the formulas below as needed, but show work!

Finite Arithmetic Series: $S_n = \frac{n}{2}(a_1 + a_n)$

Finite Geometric Series: $S_n = a_1\left(\frac{1-r^n}{1-r}\right)$

Infinite Geometric Series $\sum_{n=1}^{\infty}\left(a_1 r^{n-1}\right) = a_1\left(\frac{1}{1-r}\right)$, when $|r| < 1$

Problems:

For problems 1-3, write the first **three** terms of the following sequences (find a_1, a_2, and a_3):
(3 points each):

1. $a_n = \frac{3n}{(n-1)!}$

2. $a_{n+1} = -3a_n + 2 \quad a_1 = 5$

3. A geometric sequence with $a_1 = -6$ and $r = 3$

4. Find a_{50} for the arithmetic sequence 23, 21, 19, 17, … (4 points).

Identify each of the following sequences as arithmetic, geometric, or neither **and** write the formula for the nth term (4 points each):

5. $\frac{4}{3}, \frac{5}{9}, \frac{6}{27}, \frac{7}{81}, \frac{8}{243}, \ldots$

6. -2, 4, 10, 16, 24, …

7. 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, …

Evaluate the following sums. SHOW WORK! (3 points each):

8. $\sum_{i=3}^{8}(3i+4)$

9. Find the sum of the first 400 positive integers. (Hint: This is an arithmetic sequence.)
$1+2+3+4+\cdots+398+399+400$

10. $\sum_{n=1}^{100}6\left(\frac{2}{3}\right)^{n-1}$

11. $\sum_{n=1}^{\infty}25(0.03)^{n}$

12. $\sum_{n=5}^{30}\frac{2^{n}}{5}$

13. Use mathematical induction to prove that $2+7+12+17+\ldots+(5n-3)=\frac{5}{2}n^2-\frac{1}{2}n$.

a. What is the formula for a_n? (1 point)

b. What is the formula for S_n? (1 point)

c. Show that it is true for $n=1$. (2 points)

d. Assume that it is true for $n=k$. (2 points)

$S_k =$

e. Show that it is true for $n=k+1$ (4 points)

$S_{k+1} =$

$S_{k+1} = S_k + a_{k+1}$

14. Expand $(x - 2y)^6$ and simplify. SHOW WORK! (5 points).

15. Expand $(3x - 2i)^4$ and simplify (use $i^2 = -1$, etc…). SHOW WORK! (5 points)