Series - Sequences   **REVIEW**   **Name______________**

1. Evaluate: a) $\lim_{n\to\infty}\left(\frac{n-1}{n}\right)^n$ b) $\sum_{n=0}^{\infty}\frac{(1.1)^n}{n!}$ c) $\sum_{n=1}^{\infty}\left(\frac{8}{9}\right)^n$

2. An arithmetic sequence has $a_{10} = 1776$ and $a_{18} = 1992$

   a) find a_1 b) find n such that $a_n = 2100$

   c) $\sum_{k=1}^{20} a_k$ d) find n such that $\sum_{k=1}^{n} a_k = 46{,}425$

3. A geometric sequence has $a_5 = 16$ and $a_9 = 81$

   a) find a_1 b) find n such that $a_n = 410\frac{1}{16}$

   c) find a_{10} (*two answers)*   d) find S_{10} (*two answers)*

4. Use binomial expansion to find the coeffeicient of the x^5y^3 term in $(2x+3y)^8$

5. Find the value of x if {8, (2x+1), 50, ... } is a geometric sequence.

6. Consider a geometric series beginning with 1.
   a) find r if the series converges to 100
   b) find r if the series converges to 2
   c) find r if the series converges to 1
   d) find r if the series converges to 1/3

7. Is it possible to have a series where a_n approaches zero, but S_n approaches infinity? If so, give an example, if not, explain why.

8. a) Express the following series in sigma notation: $1-3+\frac{9}{2!}-\frac{27}{3!}+\frac{81}{4!}+...$

b) To what exact value does the above series converge?

9. What is the middle term in the 18th row of Pascal's triangle?

10. Find the first 10 terms of the recursive sequence defined by
$a_1 = 3$, $a_2 = 17$, and $a_n = \left|a_{n-2} - a_{n-1}\right|$. What is a_{100}?

11. Prove by induction: $\frac{1}{1\cdot 2}+\frac{1}{2\cdot 3}+\frac{1}{3\cdot 4}+...+\frac{1}{n(n+1)}=\frac{n}{n+1}$

12. Write out the first five terms of the expansion for each of the following

a) e^3 b) $\sqrt[3]{e}$ c) $\frac{1}{e}$ d) $\sin 1$

1) 1/e, $e^{1.1}$, 8; 2) 1533, 22, 35790, 25; 3) 256/81, 13, ±243/2, 58,025/162 or -11,605/162; 4) 48,384 ; 5) 19/2 or -21/2; 6) 99/100, 1/2, 0, not possible; 7 harmonic series, 8) $\sum_{n=0}^{\infty}\frac{(-3)^n}{n!}$, $1/e^3$; 9) ${}_{18}C_9 = 48,620$; 10) 3, 17, 14, 3, 11 ..., a_{100}=1; 11) tba 12) ; $\sum_{n=0}^{4}\frac{3^n}{n!}$, $\sum_{n=0}^{4}\frac{1}{3^n n!}$, $\sum_{n=0}^{4}\frac{(-1)^n}{n!}$, $\sum_{n=0}^{4}\frac{(-1)^n}{(2n+1)!}$