FALL 2026 - CALCULUS 2 - TEST #4A - Solutions

True or false:

F 1) All divergent series become infinite could be oscillatory
T 2) If a sequence converges, every subsequence of it converges
T 3) A series is a sequence of partial sums
T 4) The limit of a convergent sequence is unique
F 5) All geometric series converge must have $|r| < 1$
F 6) The harmonic series converges proved with integral test
T 7) The alternating harmonic series converges to $\ln 2$
T 8) The series for $\sin x$ converges for all real x $\sin x$ defined for all $x \in \mathbb{R}$
F 9) Every series either converges or becomes infinite see (1)
F 10) Every p-series converges for $p > 0$ $p > 1$ per integral test
T 11) The term-wise sum of two convergent series must converge
F 12) The term-wise difference of two divergent series must diverge consider series minus itself
F 13) $\sum_{n=1}^{\infty} \frac{x^n}{n!} = e^x$ $n = 0$
T 14) Two series may be multiplied together via the Cauchy product
T 15) $\frac{1}{1-x} + \frac{1}{1+x} = 2(1 + x^2 + x^4 + \cdots + x^{2n-2} + \cdots$ expand and cancel odd powers
F 16) Stopping a series at the n^{th} term creates a polynomial only if it a power series
T/F 17) Expansion of a function in series is unique actually no but we didn't study this
T 18) The Binomial Theorem gives a finite series $(a+b)^n = a^n + na^{n-1}b + \cdots nab^{n-1} + b^n$
F 19) Geometric series converge if the constant ratio is strictly less than 1 absolutely strictly less
F 20) Every series starts at $n = 1$
F 21) If $\sum a_n$ converges, so does $\sum na_n$ $\sum \frac{1}{n^2}$ converges but $\sum \frac{1}{n}$ does not
T 22) If $\sum a_n$ converges, so does $\sum \frac{a_n}{n}$ $\lim_{n\to\infty}|a_n| = 0$ implies $\lim_{n\to\infty}\left|\frac{a_n}{n}\right| = 0$
T 23) The Root Test calculates $\lim_{n\to\infty}|a_n|^{1/n}$
T 24) The Ratio Test calculates $\lim_{n\to\infty}\left|\frac{a_n}{a_{n-1}}\right|$ ratio is next term to previous
F 25) The Integral Test calculates $\int_0^{\infty} f(x)dx$, where $f(n) = a_n$ $\int_1^{\infty} f(x)dx$