Day 1 Notes: Sequences

A <u>sequence</u> is a list of terms: $a_1, a_2, a_3, \ldots, a_n, \ldots$ $a_1 = \text{first term}$ $a_n = \text{nth term}$ $\{a_n\} = a_1, a_2, a_3, \ldots, a_n, \ldots$

Limit of a Sequence:

Let f be a function of real variables such that $\lim_{x\to\infty} f(x) = L$. If $\{a_n\}$ is a sequence such that $f(n) = a_n$ for every positive integer n, then $\lim_{n\to\infty} a_n = L$.

$\frac{n \to \infty}{1}$	E-manual 2.
Example 1:	Example 2:
Write out the first four terms of the sequence	Find the limit of $\{a_n\} = \frac{(n+1)!}{n!}$
and then find the limit of the sequence with	n!
the nth term:	
$a_n = \frac{lnn^2}{n}$	
$a_n - n$	
Example 3:	Example 4:
Find the limit of $\{a_n\} = \{3 + (-1)^n\}$	Find the limit of $\{b_n\} = \left\{\frac{n}{1-2n}\right\}$
	(1-2/1)
	1

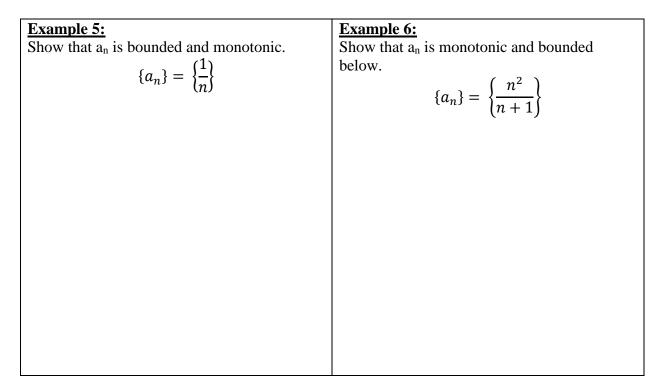
Monotonic Sequence:

 $\{a_n\}$ is monotonic if $a_1 \le a_2 \le a_3 \le \ldots \le a_n \le \ldots$ (increasing) OR $a_1 \ge a_2 \ge a_3 \ge \ldots \ge a_n \ge \ldots$ (decreasing)

Bounded Sequence:

- 1) $\{a_n\}$ is bounded above if $a_n \leq M$.
- 2) $\{a_n\}$ is bounded below if $a_n \ge N$.
 - 3) $\{a_n\}$ is bounded if $N \le a_n \le M$

If a sequence is bounded and monotonic, then it will converge.

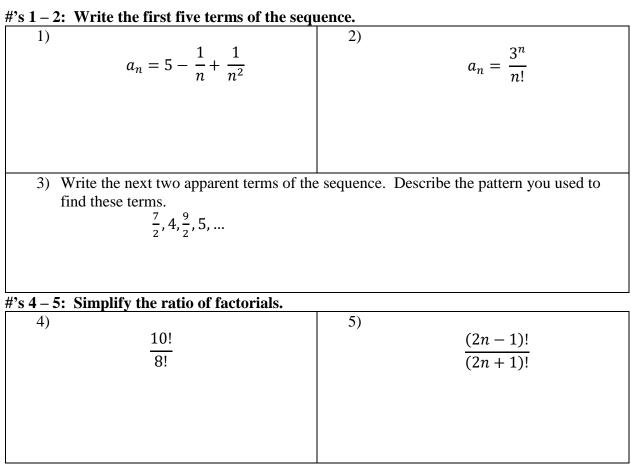


Absolute Value Theorem: If $\lim_{n \to \infty} |a_n| = 0$, then $\lim_{n \to \infty} a_n = 0$.

Example 7:

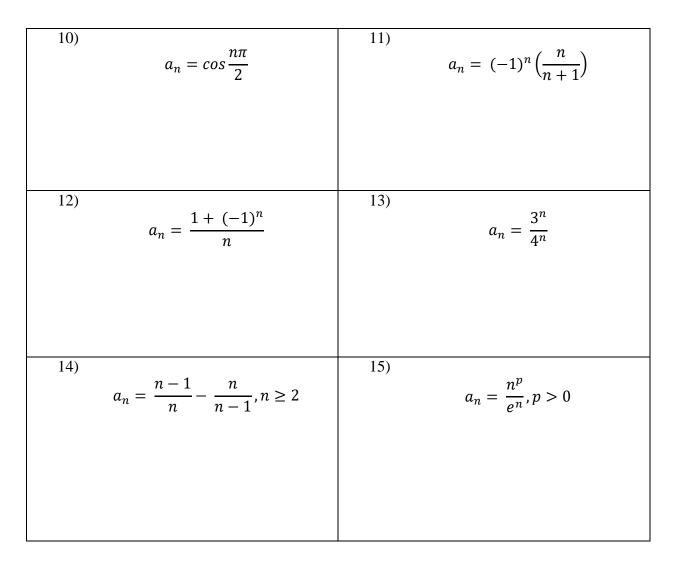
Show that
$$\lim_{n \to \infty} a_n = 0$$
 if $\{a_n\} = \left\{\frac{(-1)^n n}{3^n}\right\}$

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#'s 6-15: Determine the convergence or divergence of the sequence with the given nth term. If the sequence converges, find its limit.

6)	$a_n = \frac{5n^2}{n^2 + 2}$	7)	$a_n = \frac{2n}{\sqrt{n^2 + 1}}$
8)	$a_n = sin \frac{1}{n}$	9)	$a_n = \frac{n+1}{n}$



#'s 16 – 18: Determine whether the sequence with the given nth term is monotonic. Discuss the boundedness of the sequence.

