Math 1432

Bekki George
bekki@math.uh.edu
639 PGH

Office Hours:

Mondays 1-2pm,
Fridays noon-1pm
(also available by appointment)

Class webpage:

http://www.math.uh.edu/~bekki/Math1432.html

With sequences, we are concerned with limits of sequences as n approaches infinity.

A sequence that has a limit is said to be **convergent**.

A sequence that has no limit is said to be **divergent**.

Every convergent sequence is bounded and every unbounded sequence is divergent.

"The sequence converges"
means
"The sequence has a limit".

"The sequence diverges"
means
"The sequence does not have a limit".

Important Limits:

A. For each $a > 0$, $\dfrac{1}{n^a} \to 0 \quad as \;\; n \to \infty$

B. For each real x, $\dfrac{x^n}{n!} \to 0 \quad as \;\; n \to \infty$

C. If $|x| < 1$, then $x^n \to 0 \quad as \;\; n \to \infty$

D. $\dfrac{\ln n}{n} \to 0 \;\; as \;\; n \to \infty$

E. If $x > 0$, then $x^{\frac{1}{n}} \to 1 \quad as \;\; n \to \infty$

F. $n^{\frac{1}{n}} \to 1 \quad as \;\; n \to \infty$

G. For each real x, $\left(1+\frac{x}{n}\right)^n \to e^x \quad as \;\; n \to \infty$

Examples:

Give the limit of $\left\{(-1)^n\right\}_{n=1}^{\infty}$

Give the limit of $\left\{\frac{2n-6}{3n^2+2}\right\}_{n=1}^{\infty}$

Give the limit (if it exists) of $\left\{ \ln\left(n+1 \right) - \ln\left(n \right) \right\}_{n=1}^{\infty}$

Give the limit (if it exists) of $\left\{ \ln\left(2n+1 \right) - \ln\left(n \right) \right\}_{n=1}^{\infty}$

Give the limit (if it exists) of $\left\{ \frac{\ln\left(n+1 \right)}{n} \right\}_{n=1}^{\infty}$

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1. Give the limit of the sequence: $\left\{ \frac{ln(n+2)}{\sqrt{2}+n} \right\}_{n=1}^{\infty}$

Give the limit (if it exists) of $\left\{ \frac{3^n}{4^n} \right\}_{n=1}^{\infty}$

Give the limit (if it exists) of $\left\{ n^{\frac{1}{n+2}} \right\}_{n=1}^{\infty}$

Note: $\left\{ \left(e^{n} \right)^{\frac{1}{n}} \right\}_{n=1}^{\infty} \to e$

$\left\{ \left(stuff \right)^{\frac{1}{n}} \right\}_{n=1}^{\infty}$

may not go to 1 as n approaches infinity if "*stuff*" overpowers the exponent. Be careful!

Give the limit (if it exists) of $\left\{\left(1-\frac{1}{n}\right)^{n}\right\}_{n=1}^{\infty}$

2. Give the limit of $\left\{\left(1-\frac{2}{n}\right)^{n}\right\}_{n=1}^{\infty}$

3. Give the limit of $\left\{\frac{3n^{3}-2n+1}{1000n^{2}-n^{3}+3}\right\}_{n=1}^{\infty}$

4. Give the limit of $\left\{\cos(n\pi)\right\}_{n=1}^{\infty}$

5. Give the limit (if it exists) of the sequence $\left\{3^{\frac{2}{n}}\right\}_{1}^{\infty}$