Real Analysis

Math 310 | MWF 10:30-11:25am
Fall 1996 | 127 Fowler

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(09/20/96)

SUMMARY More Limit Theorems and Infinite limits

READING §9

Warm-Up
(5-10 minutes)

MORE USEFUL THEOREMS
We can use the following theorems to find the limits of typical sequences.

(a) $\lim_{n\to\infty}(1/n^p) = 0$ for $p > 0$

(b) $\lim_{n\to\infty}(a^n) = 0$ if $|a| < 1$

(c) $\lim(n^{1/n}) = 1$

(d) $\lim_{n\to\infty}(a^{1/n}) = 1$ for $a > 0$

Examples
Find $\lim \dfrac{n-5}{n^2+6}$

Find $\lim \dfrac{n^2+6}{n-5}$

Definition: Infinite limits
For a sequence (s_n) we say that $\lim s_n = +\infty$ provided that

$$\forall M > 0 \; \exists N \ni \quad n > N \Rightarrow s_n > M$$

(write this out in your own words)

and we say that
$\lim s_n = -\infty$ provided that

$$\forall M < 0 \; \exists N \ni \quad n > N \Rightarrow s_n < M$$

(write this out in your own words)

We say that $\lim s_n$ *exists* if

- (s_n) converges
- (s_n) diverges to $+\infty$ or $-\infty$

Examples
Prove $\lim_{n\to\infty}(\sqrt{n} - 9) = +\infty$

Prove $\lim_{n\to\infty} \dfrac{n^3 - 4}{n^2 - 2} = +\infty$

Homework Assignment (Due 9/30/96)
§9, page 40-41: **9.1(b), 9.2(b), 9.5, 9.6, 9.7, 9.8, 9.13, 9.15, 9.16, 9.17**