

MA 114 Worksheet # 3: Sequences

- Write the first four terms of the sequences with the following general terms:
 - $\frac{n!}{2^n}$
 - $\frac{n}{n+1}$
 - $(-1)^{n+1}$
- Find a formula for the n th term of the sequence $\left\{ \frac{1}{1}, -\frac{1}{8}, \frac{1}{27}, -\frac{1}{64}, \dots \right\}$.
- Conceptual Understanding:
 - What is a sequence?
 - What does it mean to say that a sequence is bounded?
 - What does it mean to say that a sequence is defined recursively?
 - What does it mean to say that a sequence converges?
- Let $a_0 = 0$ and $a_1 = 1$. Write out the first five terms of $\{a_n\}$ where a_n is recursively defined as $a_{n+1} = 3a_{n-1} + a_n^2$.
- Suppose that a sequence $\{a_n\}$ is bounded above and below. Does it converge? If not, produce a counterexample.
- Show that the sequence with general term $a_n = \frac{3n^2}{n^2 + 2}$ is increasing. Find an upper bound. Does $\{a_n\}$ converge?
- Use the appropriate limit laws and theorems to determine the limit of the sequence or show that it diverges.
 - $a_n = 1.01^n$.
 - $b_n = \frac{3n^2 + n + 1}{2n^2 - 3}$.
 - $c_n = e^{1-n^2}$.