Factorials!

n! =

**Examples:**

4! = 6! =

n!= (n – 2)! =

(n + 1)!= 0! = Why?

$\frac{5!}{7!}=$ $\frac{8!}{11!}=$ $\frac{59!}{57!}=$

$\frac{(n-2)!}{n!}=$ $\frac{(2n-1)!}{(2n+1)!}=$

**Practice**





**Section 8.1 Sequences**

A **sequence** is a list or set whose domain is a set of positive integers.

{a1, a2, . . . } where $n\in Z^{+} $

**Examples:** Find the first three terms of each sequence

$$a\_{n}=\frac{n}{n^{2}+1}$$

$$a\_{n}=\frac{n^{2}}{2^{n}-1}$$

$$a\_{n}=\frac{2^{n}}{n!}$$

$$a\_{n}=3+\left(-1\right)^{n}$$

A sequence is increasing if $a\_{n+1}>a\_{n}∀ \left(for all\right) n\geq 1$

A sequence is decreasing if $a\_{n+1}>a\_{n}∀ n\geq 1$

A **monotonic sequence** is always increasing or always decreasing (not oscillating)

A sequence can be bounded above if $a\_{n}<U$ or bounded below if $a\_{n}>L ∀ n\geq 1$

**Convergence vs. Divergence of a Sequence**

If $\lim\_{n\to \infty }a\_{n}=L$, the sequence converges to L. That means, eventually, the terms become L.

Otherwise the sequence diverges.

A divergence sequence may approach $\pm \infty $ or may be oscillating between two numbers.



**Examples**

1. {2, 4, 6, . . . .}
2. $\{1,\frac{1}{2},\frac{1}{4},\frac{1}{8},. . . \}$
3. $a\_{n}=\sin(n)$
4. $a\_{n}=\frac{\left(-1\right)^{n+1}}{n}$

**Practice:**

Determine if each sequence converges or diverges. If it converges, find the limit.

