**Calculus Section 9.5 Alternating Remainder and Conditional/Absolute Convergence**-Use the Alternating Series Remainder to determine convergence
-Classify convergence as absolute or conditional

Homework: page #625 #’s 30 – 32, 37 – 47 odd, 61, 62

 **Alternating Series Remainder**If an alternating series converges, then the sum of the series can be approximated by the partial sum Sn. The error associated with this sum is less than or equal to the first neglected term (the n + 1 term).

Remainder = Maximum Error = |S – Sn| ≤ an+1

**Example)** **Approximating the Sum of an Alternating Series**Use the 4th partial sum to approximate the sum of the series. Determine a reasonable interval for the actual sum of the series. Is the partial sum S4 an over or underestimate?
$$\sum\_{n=1}^{\infty }(-1)^{n+1}\frac{1}{n!}$$

**Example) What alternating series partial sum will have an error less than or equal to 0.001.**

$$\sum\_{n=0}^{\infty }\frac{(-1)^{n}}{(n+1)!}$$

$$\sum\_{n=1}^{\infty }\frac{(-1)^{n}}{2n-1}$$

Example) Given . What is the smallest number M for which the alternating

$$P\_{n}\left(x\right)=\sum\_{k=1}^{n}(-1)^{k}\frac{x^{k}}{k^{2}+k+1}$$

error bound guarantees that $\left|f\left(1\right)-P\_{4}(1)\right|\leq M$ ?

**Definitions of Absolute and Conditional Convergence**A series **converges absolutely** (is absolutely convergent) if converges.
A series **converges conditionally** (is conditionally convergent) if converges but diverges.

A conditionally convergent series converges only on the condition that it alternates (classic example: harmonic series) whereas an absolutely convergent series will converge whether it alternates or not.

**Example) Does the series converge absolutely, converge conditionally, or diverge?**

$$\sum\_{n=1}^{\infty }\frac{(-1)^{\frac{n^{2}+n}{2}}}{3^{n}}$$

$$\sum\_{n=1}^{\infty }\frac{(-1)^{n}}{\sqrt[3]{n^{2}}}$$