§ 11.5 Homework's up.

Alternating Series

$$\sum_{n=1}^{\infty} (-1)^n \frac{1}{n} = -1 + \frac{1}{2} - \frac{1}{3} + \frac{1}{4} \cdots$$

$$\sum_{n=1}^{\infty} (-1)^n a_n \qquad a_n > 0 \ \forall n$$

$$a_n \to 0$$

$$a_{n+1} < a_n \quad \forall n$$

$$\sum_{n=1}^{M} (-1)^n a_n = S_M$$

$$E_M = \text{Error}_M = |S - S_n| < a_{m+1}$$

Converge Conditionally

-vs-

Converge Absolutely

$\sum b_n$ -vs- $\sum |b_n|$

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

$$\xrightarrow{n \to \infty} 0$$

Decreasing?

Induction: Assume $|a_n| > |a_{n+1}|$

Show $|a_{n+1}| > |a_n|$

a_n is just

$a_n : \mathbb{N} \longrightarrow \mathbb{R}$

$a_n = f(n)$ Show decreasing by taking

$\frac{d}{dn}(f(n)) = f'(n)$ If $f'(n) < 0$

$\Rightarrow$ Done!

$f(x) = e^{-x^2} \Rightarrow$ Fine Work on Take-Home 2

$f^{(5)}(x) = ?$

$\frac{1}{4} + \frac{1}{6} + \frac{1}{8} + \frac{1}{10}$

$n=1 \quad n=2 \quad n=3$

4

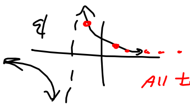
$2(1)+2 \quad 2(2)+2 \quad 2(3)+2$

$$\frac{3}{2(n+1)}$$

$\frac{3}{4} - \frac{3}{6} + \frac{3}{8} - \frac{3}{10} + \cdots$

$= \sum_{n=1}^{\infty} (-1)^{n-1} \frac{3}{2n+2} \longrightarrow$ b/c $\frac{3}{2n+2} \xrightarrow{n \to \infty} 0$

$\frac{n^n}{n!}$



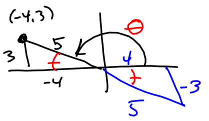
$n=-1$

All terms $a_n > 0$

$a_{n+1} < a_n \ \forall n \geq 1$

Keenan sez $\leq$ is the actual minimum requirement.

10.3 Talk from last time



$\arctan\left(\frac{3}{-4}\right)$

$\theta = 180^\circ + \arctan\left(\frac{3}{-4}\right)$

$2\sqrt{\frac{2+\sqrt{3}}{2}} - 2\sqrt{\frac{2-\sqrt{3}}{2}} = 2!$

$\sqrt{2^2}\sqrt{\frac{2+\sqrt{3}}{2}} - \sqrt{2^2}\sqrt{\frac{2-\sqrt{3}}{2}}$

$= \sqrt{4\cdot\frac{2+\sqrt{3}}{2}} - \sqrt{4\cdot\frac{2-\sqrt{3}}{2}} = \sqrt{4+2\sqrt{3}} - \sqrt{4-2\sqrt{3}}$

$= \sqrt{(1+\sqrt{3})^2} - \sqrt{(1-\sqrt{3})^2}$

Adison's Trick

$|1+\sqrt{3}| - |1-\sqrt{3}|$

$= 1+\sqrt{3} - (\sqrt{3}-1) = 1+\sqrt{3}-\sqrt{3}+1 = 2!$

$(1+\sqrt{3})^2 = 1^2 + 2\sqrt{3} + 3 = 4+2\sqrt{3}$

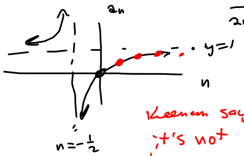
$(1-\sqrt{3})^2 = 1-2\sqrt{3}+3 = 4-2\sqrt{3}$

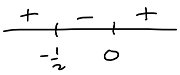
$$-\frac{2}{3}+\frac{4}{4}-\frac{6}{5}+\frac{8}{6}-\frac{10}{7}$$

$$\sum_{n=1}^{\infty}(-1)^n\frac{2n}{2n+1}$$

Doesn't Converge

$$\frac{2n}{2n+1}\xrightarrow{n\to\infty}\frac{2}{2}=1\neq 0$$





$\star = 0$

Keenan says it's not decreasing, also.

$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n+p}$ what p works?

Any p that's not a negative integer.

(Book said any p not negative)