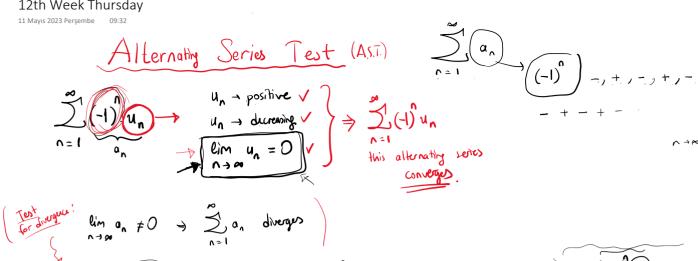
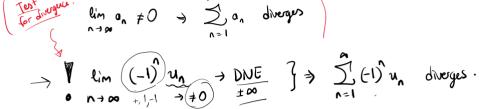
## 12th Week Thursday





( ) 1 harmonic + divergent

$$\int_{n=1}^{\infty} (-1)^{n} \left( \frac{3}{2} \right)^{n} \Rightarrow$$

$$\int \int (-1)^{n} \left(\frac{3}{2}\right)^{n} \Rightarrow \frac{|\operatorname{rabs} \operatorname{odd}| k | \operatorname{testiyle}|}{|\operatorname{col}|} de |\operatorname{rabs} \operatorname{odd}| r.$$

$$\Rightarrow \left(-\frac{3}{2}\right)^{n} = -\frac{3}{2}$$

$$r = -\frac{3}{2} \quad |\operatorname{rl}| > 1 \Rightarrow |\operatorname{rabs} \operatorname{odd}| r.$$

$$\operatorname{geometrik}_{k} :$$

$$\begin{array}{ccc}
 & \stackrel{\sim}{\longrightarrow} & (-1)^{\hat{1}} & \underbrace{\left(\frac{1}{3}\right)^{\hat{1}}}_{3} \\
 & \stackrel{\sim}{\longrightarrow} & 
\end{array}$$

$$\int_{n=1}^{\infty} (-1)^{n} \left(\frac{1}{3}\right)^{n} \Rightarrow \left(-\frac{1}{3}\right)^{n} \qquad \alpha = -1/3$$

$$r = -1/3 \qquad \text{if } 1 < 1 \Rightarrow \text{yakunsaketiv.}$$

$$\text{geometrik.}$$

$$\Rightarrow A.S.T. ile. \quad u_n = \left(\frac{1}{3}\right)^n \quad \text{portiff} \quad \downarrow \\ \text{armian} \quad \downarrow \\ \text{lin} \quad \frac{1}{3} = 0 \quad \checkmark \quad \Rightarrow \quad \text{yolumodutif.}$$

$$\int_{N=1}^{\infty} \frac{(-1)^{n}}{(n+1)}$$

$$= \frac{n}{n+1} \qquad \text{pointif} \checkmark \\ \text{arelon } ? \times$$

$$tcm = \frac{1.(n+1)-n\cdot 1}{(n+1)^2} = \frac{1}{(n+1)^2} > 0$$

$$\lim_{n \to \infty} u_n = \lim_{n \to \infty} \frac{n}{n + 1} = 1 \neq 0$$

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

$$u_n = \frac{n^2}{n^3 + 1}$$

$$u_{n} = \frac{n^{2}}{n^{3}+1}$$

$$\lim_{n \to \infty} \frac{2n(n^{3}+1) - n^{2} \cdot 3n^{2}}{2n(n^{3}+1)^{2}} = \frac{2n-n^{4}}{(n^{3}+1)^{2}}$$

$$\lim_{n \to \infty} u_{n} = \lim_{n \to \infty} \frac{n^{2}}{n^{3}+1} = 0$$

$$\lim_{n \to \infty} u_{n} = \lim_{n \to \infty} \frac{n^{2}}{n^{3}+1} = 0$$

**2–20** Test the series for convergence or divergence.

2. 
$$\frac{2}{3}$$
 -  $\frac{2}{5}$  +  $\frac{2}{7}$  -  $\frac{2}{9}$  +  $\frac{2}{11}$  -  $\cdots$   
3.  $-\frac{2}{5}$  +  $\frac{4}{6}$  -  $\frac{6}{7}$  +  $\frac{8}{8}$  -  $\frac{10}{9}$  +  $\cdots$ 

3. 
$$-\frac{2}{5} + \frac{4}{6} - \frac{6}{7} + \frac{8}{8} - \frac{10}{9} + \cdots$$

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

ence.
$$\int_{n=1}^{\infty} (-1)^{n+1} \frac{2}{2n+1} dx$$

$$u_n = \frac{2}{2n+1} dx$$

$$\frac{2}{2n+1} \Rightarrow 0 \text{ aratan} \checkmark$$

$$\lim_{n \to \infty} \frac{2}{2n+1}$$

4. 
$$\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} - \frac{1}{\sqrt{5}} + \frac{1}{\sqrt{6}} - \cdots$$

firm 
$$\rightarrow \frac{0-1. \frac{1}{2(n+1)}}{n+1} = \frac{-1}{(n+1)2(n+1)}$$

$$= \frac{1}{n+1} \qquad \text{positif} \quad \checkmark$$

$$\text{ozalon} \quad \checkmark$$

$$\text{lin} \quad 1$$

16. 
$$\sum_{n=1}^{\infty} \frac{n \cos(n\pi)}{2^n} \Leftrightarrow \sum_{n=1}^{\infty} \frac{(-1)^n}{2^n}$$

$$n=1$$

$$= \frac{1 \cdot \cos \pi}{2^{1}}$$

$$= \frac{2 \cdot \cos 2\pi}{2^{2}} + \frac{3 \cdot \cos 3\pi}{2^{3}} + \frac{4 \cdot \cos 4\pi}{2^{4}} + \dots$$

$$+ \frac{3 \cos 3\Pi}{2^3}$$

$$u_n = \frac{n}{2^n}$$

$$\frac{1.2^{2}-n.2^{2}\ln 2}{2^{2^{2}}} = \frac{2^{n}(1-n\ln 2)}{2^{2^{n}}}$$

$$\lim_{h\to\infty} \frac{n}{n^n} = \frac{1}{h^n} \lim_{h\to\infty} \frac{1}{n^n} = \frac{1}{n^n} = 0$$

$$\Rightarrow \frac{1}{a_n} = \frac{n+1}{2^{n+1}} \cdot \frac{2}{n} = \frac{n+1-2n}{2^{n+1}} = \frac{1-n}{2^{n+1}} < 0$$

$$\Rightarrow a_{n+1} - a_n = \frac{n+1}{2^{n+1}} - \frac{n}{2^n} = \frac{n+1-2n}{2^{n+1}} = \frac{1-n}{2^{n+1}} < 0$$

$$\sum_{n=1}^{\infty} (-1)^n \left( \frac{n}{n!} \right)$$

$$20. \sum_{n=1}^{\infty} (-1)^n \left( \sqrt{n+1} - \sqrt{n} \right)$$

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

$$\frac{n!}{n!} = \frac{n^n}{n!}$$
 possibif  $\sqrt{n!}$  azalan?

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

$$a_{n} = \frac{(n+1)^{n+1}}{a_{n}} \cdot \frac{n^{n}}{n} = \frac{(n+1)^{n}}{n^{n}}$$

$$a_{n} = \frac{(n+1)^{n}}{n}$$

$$= \left(\frac{v}{v+1}\right)_{v} = \left(1 + \frac{v}{v}\right)$$

>7

$$\lim_{n \to \infty} \frac{n^n}{n!} = \lim_{n \to \infty} \frac{(n, n, \dots, n)}{(n, (n-1), \dots, 2, 1)} = \infty \neq 0$$

$$\sum_{n=1}^{\infty} (-1)^n \frac{n^n}{n!} \qquad \lim_{n \to \infty} (-1)^n \frac{1}{n!} \neq 0 \Rightarrow \frac{1 \text{ rabsolube teatily le}}{1 \text{ rabsolube}}$$

**20.** 
$$\sum_{n=1}^{\infty} (-1)^n (\sqrt{n+1} - \sqrt{n})$$

with 
$$\langle A.S.T. ike$$

Lim  $u_n \stackrel{?}{=} 0$ 

yakınvakıtır

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

$$\lim_{n\to\infty} \frac{\left(\sqrt{n+1}-\sqrt{n}\right)\left(\sqrt{n+1}+\sqrt{n}\right)}{\left(\sqrt{n+1}+\sqrt{n}\right)} = \lim_{n\to\infty} \frac{\sqrt{n+1}-\sqrt{n}}{\left(\sqrt{n+1}+\sqrt{n}\right)} = \frac{1}{n} = 0$$

Alterne p-serileri: 
$$\sum_{n=1}^{\infty} (-1)^n \frac{1}{n^n}$$

$$(\rightarrow P=0) \qquad \sum_{n=1}^{\infty} (-1)^n . 1 \qquad \lim_{n\to\infty} (-1)^n \neq 0 \Rightarrow (\text{ralksaktik testiyk (rabsaktir}))$$

$$\int_{n=1}^{\infty} (-1)^{n} \frac{1}{(n^{p})^{n}} = \int_{n-2}^{\infty} \frac{u_{n} = positiff}{azalon \times AST}$$

$$\lim_{n \to \infty} u_{n} = \infty$$

$$\lim_{n \to \infty} u_{n} = \infty$$

Absolute Convergence / Conditional Convergence

