

**Часть 1. Числовые ряды. Исследовать сходимость числовых рядов (а – д).**

№	Задачи				
	а	б	в	г	д
1	$\sum_{n=1}^{\infty} (-1)^n n^2 \sin\left(\frac{1}{4n^2}\right)$	$\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n\sqrt{\ln^3 n}}$	$\sum_{n=1}^{\infty} \frac{3^n}{(3n)!}$	$\sum_{n=1}^{\infty} \frac{1}{n^2 + \operatorname{ch} n}$	$\sum_{n=2}^{\infty} (-1)^{n+1} \frac{\ln \sqrt[3]{n}}{\sqrt[3]{n}}$
2	$\sum_{n=2}^{\infty} \frac{(-1)^n}{n \cdot \ln^4 n}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1 \cdot 4 \cdot 7 \cdot \dots \cdot (3n-2)}{1 \cdot 5 \cdot 9 \cdot \dots \cdot (4n-3)}$	$\sum_{n=1}^{\infty} \frac{1}{n + \operatorname{sh} n}$	$\sum_{n=2}^{\infty} (-1)^{n+1} \frac{\ln \sqrt[5]{n}}{\sqrt[5]{n}}$	$\sum_{n=1}^{\infty} \frac{n^2}{100n-1} \sin\left(\frac{1}{n}\right)$
3	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1 \cdot 5 \cdot 9 \cdot \dots \cdot (4n-3)}{2 \cdot 5 \cdot 8 \cdot \dots \cdot (3n-1)}$	$\sum_{n=1}^{\infty} (-1)^n \frac{\sin\left(\frac{1}{n}\right)}{\sqrt[3]{n^4} + \sqrt[4]{n^3}}$	$\sum_{n=1}^{\infty} \frac{\sqrt[4]{n}}{\sqrt{n^3} + 2n + \ln n}$	$\sum_{n=1}^{\infty} n \operatorname{tg}\left(\frac{\pi}{1000n}\right)$	$\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n \cdot \sqrt[4]{(\ln n + 3)^3}}$
4	$\sum_{n=2}^{\infty} (-1)^n \frac{\ln n}{\sqrt{n^3}}$	$\sum_{n=1}^{\infty} (-1)^n \frac{1 \cdot 5 \cdot 9 \cdot 13 \cdot \dots \cdot (4n-3)}{4^n}$	$\sum_{n=1}^{\infty} \operatorname{sh} \frac{n^3}{(10n-1)(100n-1)}$	$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt[10]{n} \cdot \operatorname{arctg} \sqrt[10]{n}}$	$\sum_{n=1}^{\infty} e^{-\sqrt[5]{n}} \sqrt[3]{\frac{n+3}{n^5+5}}$
5	$\sum_{n=1}^{\infty} \frac{n \cdot \sin n}{\sqrt[4]{n^{10}} + 10}$	$\sum_{n=1}^{\infty} 3^n \cdot \left(\frac{n}{n+1}\right)^{n^2}$	$\sum_{n=1}^{\infty} \operatorname{ch} \frac{n^4}{4^n}$	$\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n\sqrt{\ln^2 n + 1}}$	$\sum_{n=1}^{\infty} (-1)^n \frac{1 \cdot 4 \cdot 7 \cdot \dots \cdot (3n-2)}{3^n}$
6	$\sum_{n=1}^{\infty} \operatorname{tg}\left(\frac{\pi}{3 \cdot \sqrt[4]{n}}\right)$	$\sum_{n=1}^{\infty} \operatorname{ch} \frac{(n+1)(n+2)}{n^3}$	$\sum_{n=2}^{\infty} \frac{(-1)^n}{n \cdot \sqrt[4]{(\ln n + 5)^3}}$	$\sum_{n=1}^{\infty} \frac{(-1)^{n+1} \cdot n!}{1 \cdot 4 \cdot 7 \cdot \dots \cdot (3n-2)}$	$\sum_{n=1}^{\infty} e^{-n^3} \sqrt{\frac{n+1}{n^5 + 2n + 3}}$
7	$\sum_{n=1}^{\infty} \frac{n^2 \cdot \sin \frac{1}{n}}{2n+3}$	$\sum_{n=2}^{\infty} (-1)^n \frac{\ln n}{\sqrt[3]{n^4}}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n!}{(2n)!}$	$\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln^2 n}$	$\sum_{n=1}^{\infty} \frac{n^2 + \sqrt{n^8 + 1}}{\sqrt{n^9 + 1}}$
8	$\sum_{n=2}^{\infty} (-1)^{n+1} \frac{\ln^2 n}{n^2}$	$\sum_{n=1}^{\infty} (-1)^n \frac{(2n-1)!}{n!}$	$\sum_{n=1}^{\infty} \frac{1}{\operatorname{ch} n + 1}$	$\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{\sqrt{n} + \sqrt{\ln n}}$	$\sum_{n=1}^{\infty} \sin \frac{n\pi + 3}{3n + \pi}$
9	$\sum_{n=1}^{\infty} (-1)^n \frac{(3n+1)!}{(n!)^2}$	$\sum_{n=1}^{\infty} \frac{\sin(2n)}{n^4 + \sqrt{n}}$	$\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n \cdot \sqrt[3]{1 + \ln n}}$	$\sum_{n=1}^{\infty} \cos \frac{n^3}{3^n}$	$\sum_{n=1}^{\infty} \frac{\sqrt[3]{n^2} + \ln n}{\sqrt{n} + 2n^2}$

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10	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{\operatorname{sh} n}{\operatorname{ch}^2 n}$	$\sum_{n=1}^{\infty} (-1)^n \frac{10^n}{4 \cdot 9 \cdot 14 \cdot \dots \cdot (5n-1)}$	$\sum_{n=1}^{\infty} 3 \frac{3n-1}{3^n}$	$\sum_{n=2}^{\infty} (-1)^{n+1} \frac{\ln \sqrt[5]{n^4}}{\sqrt[5]{n^4}}$	$\sum_{n=1}^{\infty} \operatorname{tg} \left( \frac{\pi}{2^{3n}} \right)$
11	$\sum_{n=1}^{\infty} (-1)^n \frac{(2n-1)!}{(3n-1)!}$	$\sum_{n=1}^{\infty} \left( 0.1 + \ln \frac{n^2}{n^2+2} \right)^5$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{\operatorname{ch} n}{\operatorname{sh}^2 n}$	$\sum_{n=1}^{\infty} 5^{-\sqrt{n}} \cdot \sqrt[4]{\frac{n+2}{2n^5+n^7}}$	$\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[3]{n^2} \cdot \operatorname{arctg} \sqrt[3]{n}}$
12	$\sum_{n=1}^{\infty} (-1)^n \frac{(3n-1)!}{(2n-1)!}$	$\sum_{n=1}^{\infty} \frac{1}{\operatorname{sh} n + 1}$	$\sum_{n=1}^{\infty} \frac{\sin \sqrt[5]{n^9}}{\sqrt[5]{n^9}}$	$\sum_{n=1}^{\infty} \left( 0.1 + \operatorname{tg} \frac{1}{n} \right)^{10}$	$\sum_{n=2}^{\infty} (-1)^n \frac{\sqrt{\ln n - 1}}{n \cdot \sqrt{\ln n}}$
13	$\sum_{n=2}^{\infty} (-1)^{n+1} \frac{n}{(n + \ln n)^2}$	$\sum_{n=1}^{\infty} \frac{\sin(\sqrt{n} \cdot e^n)}{\sqrt{n} \cdot e^n}$	$\sum_{n=1}^{\infty} \left( 1 + \frac{3}{n} \right)^n$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{\operatorname{ch} n}{\operatorname{sh}^3 n}$	$\sum_{n=1}^{\infty} (-1)^n \frac{4 \cdot 9 \cdot 14 \cdot \dots \cdot (5n-1)}{10^n}$
14	$\sum_{n=1}^{\infty} \sqrt[4]{\frac{n^2+1}{n^7+2n^3+1}} \cdot \cos \frac{3}{n^2}$	$\sum_{n=2}^{\infty} \ln \left( \frac{n+1}{n-1} \right)^n$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{e^{-\sqrt{n}}}{\sqrt{n}}$	$\sum_{n=1}^{\infty} (-1)^n \frac{3^n}{(3n-2)!}$	$\sum_{n=1}^{\infty} (-1)^n \operatorname{arcsin} \frac{\sqrt[5]{n}}{1+\sqrt{n}}$
15	$\sum_{n=3}^{\infty} \left( \frac{n+2}{n-2} \right)^n$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{\operatorname{sh} \frac{1}{n}}{n^2}$	$\sum_{n=1}^{\infty} (-1)^n \frac{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)}{5 \cdot 6 \cdot 7 \cdot \dots \cdot (n+4)}$	$\sum_{n=2}^{\infty} (-1)^{n+1} \frac{\sqrt{n}}{\sqrt{n^2 + \ln n}}$	$\sum_{n=1}^{\infty} \frac{\cos(n \cdot e^n)}{n \cdot e^n}$
16	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{\operatorname{sh} n}{(\operatorname{ch} n + 5)^4}$	$\sum_{n=1}^{\infty} (-1)^n \frac{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)}{10^{n^2}}$	$\sum_{n=1}^{\infty} \frac{1}{\sqrt[5]{n^2} \cdot \cos \frac{1}{n^2}}$	$\sum_{n=1}^{\infty} \frac{(-1)^n \cdot n}{2 \sqrt[4]{n^5} + \sqrt[5]{n^4}}$	$\sum_{n=1}^{\infty} \ln \left( 1 + \frac{1}{100n} \right)^n$
17	$\sum_{n=1}^{\infty} (-1)^n \frac{n!}{5^{2n}}$	$\sum_{n=1}^{\infty} (-1)^n \sin \frac{\pi}{4 \sqrt[5]{n}}$	$\sum_{n=1}^{\infty} e^{-4\sqrt{n}} \frac{n^3+2}{n^6+3n^3+1}$	$\sum_{n=1}^{\infty} \left( 2 + \ln \frac{n+1}{n} \right)^2$	$\sum_{n=1}^{\infty} \frac{\operatorname{sh} n}{(3 + \operatorname{ch} n)^2}$
18	$\sum_{n=1}^{\infty} (-1)^n \frac{n!}{3^{2n-1}}$	$\sum_{n=2}^{\infty} \frac{(-1)^n}{\sqrt[4]{n + \ln n}}$	$\sum_{n=1}^{\infty} \left( 1 + \sin \frac{\pi}{2n} \right)^3$	$\sum_{n=2}^{\infty} (-1)^{n+1} \frac{\ln n}{n^4}$	$\sum_{n=1}^{\infty} \operatorname{arcsin} \frac{\sqrt[4]{n}}{n^2 + \sqrt[3]{n^2}}$
19	$\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt[3]{n} + 2}{\sqrt[4]{n} + \sqrt{n}}$	$\sum_{n=1}^{\infty} \operatorname{tg} \left( \frac{n+1}{4n+3} \pi \right)$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{e^{3/n} - e^{2/n}}{n^2}$	$\sum_{n=1}^{\infty} (-1)^n \frac{(3n)!}{(3+n)!}$	$\sum_{n=1}^{\infty} \frac{2^{-\sqrt[4]{n^3}}}{\sqrt[4]{n^7}}$
20	$\sum_{n=1}^{\infty} (-1)^n \ln \frac{3n+2}{n+2}$	$\sum_{n=1}^{\infty} \frac{\operatorname{ch} n}{(5 + \operatorname{sh} n)^3}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n^{10}}{n!}$	$\sum_{n=1}^{\infty} \frac{n^2}{\ln n \cdot (n^4 + 5n + 1)}$	$\sum_{n=1}^{\infty} (-1)^n \operatorname{tg} \left( \frac{\pi}{2 \sqrt[3]{n}} \right)$

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21	$\sum_{n=1}^{\infty} \frac{\operatorname{sh} n}{\sqrt{\operatorname{ch}^3 n}}$	$\sum_{n=1}^{\infty} (-1)^n \frac{3^n}{(3n-2)!}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \sin \frac{\pi}{2\sqrt[8]{n^3}}$	$\sum_{n=1}^{\infty} \frac{1}{(3n-2) \cdot 2^{3n-2}}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \ln \frac{e^4}{4^n}$
22	$\sum_{n=1}^{\infty} \frac{(3n-1)!}{2^n}$	$\sum_{n=1}^{\infty} \frac{3^{-\sqrt[5]{n^6}}}{\sqrt[5]{n^6 + 3n - 1}}$	$\sum_{n=1}^{\infty} (-1)^n \operatorname{tg} \frac{1}{\sqrt{n}}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \ln \frac{5^n}{n^5}$	$\sum_{n=1}^{\infty} (-1)^n \frac{1}{n^2} \cdot \operatorname{sh} \frac{2}{n}$
23	$\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[5]{n} + \ln n}$	$\sum_{n=1}^{\infty} \frac{1}{5^n \cdot (\sqrt[3]{n} + 3)}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \sin \frac{n\pi + 2}{4n + 5\sqrt{n}}$	$\sum_{n=1}^{\infty} (-1)^n \frac{e^{2/n} - e^{-1/n}}{n^2}$	$\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$
24	$\sum_{n=1}^{\infty} (-1)^n \frac{(2n)!}{(n!)^2}$	$\sum_{n=1}^{\infty} \frac{n}{5^{(n+1)(n+2)}}$	$\sum_{n=1}^{\infty} \frac{3e^{3n} - e^{-n}}{(e^{3n} + e^{-n})^3}$	$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{3^n \cdot (\sqrt{n} + 1)}$	$\sum_{n=2}^{\infty} \frac{(-1)^n}{n + \ln^2 n}$
25	$\sum_{n=1}^{\infty} (-1)^{n+1} e^{\frac{n}{3^n}}$	$\sum_{n=1}^{\infty} \frac{2e^{2n} - e^n}{(e^{2n} - e^n)^2}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{(n!)^3}{(3n-1)!}$	$\sum_{n=1}^{\infty} \frac{(-1)^n}{\ln(\sqrt[10]{n} + 1)}$	$\sum_{n=1}^{\infty} \sqrt[3]{\frac{n + \ln n}{n^5 + 1}}$
26	$\sum_{n=1}^{\infty} \frac{e^n + 2e^{2n}}{(e^n + e^{2n})^2}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1 \cdot 4 \cdot 7 \cdot \dots \cdot (3n-2)}{(2n)!}$	$\sum_{n=1}^{\infty} \frac{\sin \sqrt[3]{n^4}}{\sqrt[3]{n^4}}$	$\sum_{n=2}^{\infty} \frac{(-1)^n \cdot n}{n^2 + \ln n}$	$\sum_{n=1}^{\infty} e^{\frac{n+3}{n+1}}$
27	$\sum_{n=1}^{\infty} \frac{(-1)^n \cdot (n!)^2}{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)}$	$\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{\sqrt{\ln^3 n}} f$	$\sum_{n=1}^{\infty} \frac{\sqrt{n^3} + \sqrt[3]{n^2}}{5\sqrt[5]{n^3} + 3\sqrt[3]{n^5} + 10}$	$\sum_{n=1}^{\infty} \sin \frac{n}{n^3 + 2}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{e^{-\sqrt[3]{n}}}{\sqrt[3]{n^2}}$
28	$\sum_{n=2}^{\infty} \frac{(-1)^n}{\sqrt[3]{\ln^5 n}}$	$\sum_{n=1}^{\infty} \sqrt[5]{\frac{n}{n^2 - 5n + 10}}$	$\sum_{n=1}^{\infty} (-1)^{n+1} \cos\left(\frac{n}{n^2 + 1}\right)$	$\sum_{n=1}^{\infty} (-1)^n \frac{e^{1/n} - e^{-2/n}}{n^2}$	$\sum_{n=1}^{\infty} \frac{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)}{(n!)^2}$
29	$\sum_{n=1}^{\infty} \frac{e^{\frac{3}{n}} - e^{\frac{1}{n}}}{n^2}$	$\sum_{n=1}^{\infty} \cos \frac{\pi}{6^n}$	$\sum_{n=1}^{\infty} \frac{(-1)^{n+1} (2n)!}{1 \cdot 4 \cdot 7 \cdot \dots \cdot (3n-2)}$	$\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln \sqrt[5]{n^3}}$	$\sum_{n=1}^{\infty} \frac{\sqrt[5]{n^2 + 2}}{n\sqrt{n} + n + \sqrt{n}}$
30	$\sum_{n=1}^{\infty} \cos \frac{n+1}{n^3}$	$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt{n} (e^{\sqrt{n}} + e^{-\sqrt{n}})}$	$\sum_{n=1}^{\infty} \frac{(2n-1)!}{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)}$	$\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln \sqrt[5]{n}}$	$\sum_{n=2}^{\infty} \frac{n^2 + 2 \ln n}{n^3 + 3\sqrt{n-1}}$