Laboratorijas darbi par saitļu rindām

Pirmais laboratorijas darbs par skaitļu rindām
Pozitīvu skaitļu rindas I

Noskaidrot dotās skaitļu rinads konverģenci vai diverģenci, izmantojot konverģences nepieciešamo nosacījumu vai kādu no salīdzināšanas pazīmēm. Pirmajā piemērā, izmantojot parciālsummas, aprēķināt dotās skaitļu rindas summu.

1. variants.

1. $\sum_{n=1}^{\infty} \frac{1}{n(n+1)(n+2)}$
2. $\sum_{n=1}^{\infty} \frac{1}{4n^2+4n-3}$
3. $\sum_{n=1}^{\infty} \frac{1}{n2^n}$
4. $\sum_{n=1}^{\infty} \frac{\ln n}{\sqrt{n}}$
5. $\sum_{n=2}^{\infty} \frac{1}{(n+\sqrt{2})(n-\sqrt{2})}$
6. $\sum_{n=1}^{\infty} \arcsin \frac{n\pi}{n^2\sqrt{n}+n+1}$

2. variants.

1. $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$
2. $\sum_{n=1}^{\infty} \frac{35n^2+56n+6}{(394n+21)^2}$
3. $\sum_{n=1}^{\infty} \frac{1}{(3n+2)^3}$
4. $\sum_{n=2}^{\infty} \frac{1}{\ln n}$
5. $\sum_{n=1}^{\infty} \frac{1}{(5n-4)(6n-5)}$
6. $\sum_{n=1}^{\infty} \frac{(1+\frac{1}{n})^{n^2}}{e^n}$

3. variants.

1. $\sum_{n=0}^{\infty} \frac{1}{3^n} + \frac{1}{7^{n-1}}$
2. $\sum_{n=1}^{\infty} \frac{\sin^4 n}{n^3}$
3. $\sum_{n=1}^{\infty} \frac{e^{2n}}{(2+\frac{4}{n})^{n^2}}$
4. $\sum_{n=1}^{\infty} \cos \frac{1}{n^2}$
5. $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$
6. $\sum_{n=1}^{\infty} \frac{n}{(n+3)3^n}$

4. variants.

1. $\sum_{n=0}^{\infty} \frac{1}{5^{n+1}} + \frac{1}{7^n}$
2. $\sum_{n=1}^{\infty} \left(\frac{2n^2+1}{2n^2+3}\right)^{n^2}$
3. $\sum_{n=1}^{\infty} \sin \frac{\pi}{4^n}$
4. $\sum_{n=1}^{\infty} \frac{1}{1+11^n}$
5. $\sum_{n=1}^{\infty} \frac{n^3+8n^2}{5n^5+6n^4}$
6. $\sum_{n=1}^{\infty} \frac{7n+3}{8n+5}$

5. variants.

1. $\sum_{n=2}^{\infty} \ln \frac{n^3+1}{n^3-1}$
2. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{(5n-4)(7n-6)}}$
3. $\sum_{n=1}^{\infty} \frac{3+(-1)^n}{2^{n+1}}$
4. $\sum_{n=1}^{\infty} \cos n^{-1}$
5. $\sum_{n=1}^{\infty} \frac{(n^2-4)^2}{(n^3-8)^2}$
6. $\sum_{n=1}^{\infty} \frac{n^2+3n-2}{(39n-38)^2}$

7. variants.

1. $\sum_{n=1}^{\infty} \frac{1}{n(n+2)}$
2. $\sum_{n=1}^{\infty} \frac{n+2}{(n+2)2^n}$
3. $\sum_{n=1}^{\infty} \frac{\sqrt[3]{n}}{(2n-1)(5\sqrt[3]{n}-1)}$
4. $\sum_{n=1}^{\infty} n^2 \sin(\frac{1}{1+n^2})$
5. $\sum_{n=1}^{\infty} \ln \frac{n^4+3n^3}{n^4+1}$
6. $\sum_{n=1}^{\infty} \sqrt[n]{678}$

6. variants.

1. $\sum_{n=1}^{\infty} \frac{1}{2^n} - \frac{2}{7^n}$
2. $\sum_{n=1}^{\infty} \frac{n^2+3n+2}{5n^4+3n^3+2n+1}$
3. $\sum_{n=1}^{\infty} 2n \sin(2n)^{-1}$
4. $\sum_{n=2}^{\infty} \frac{1}{(\ln n)^{\ln n}}$
5. $\sum_{n=1}^{\infty} \frac{1}{(3+(-1)^n)^n}$
6. $\sum_{n=1}^{\infty} \frac{1}{\sqrt[n]{0,3}}$

8. variants.

1. $\sum_{n=5}^{\infty} \frac{1}{n(n-4)}$
2. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n(n+2)}}$
3. $\sum_{n=1}^{\infty} \frac{n^2}{2^{n^2}}$
4. $\sum_{n=1}^{\infty} tg^4\left(\frac{\pi}{n+2}\right)$
5. $\sum_{n=2}^{\infty} \ln \frac{(n+1)^2}{n^2-1}$
6. $\sum_{n=1}^{\infty} \arccos \frac{n+3}{\sqrt[3]{n^5+27}}$

9. variants.

1. $\sum_{n=1}^{\infty} \frac{3n^2+3n+1}{n^3(n+1)^3}$
2. $\sum_{n=3}^{\infty} \frac{n-3}{n^2+1}$
3. $\sum_{n=1}^{\infty} \frac{15n^2+3n+1}{14n^2+5n-1}$
4. $\sum_{n=1}^{\infty} \ln\left(\frac{n^2+5n+3}{n^2+5n}\right)$
5. $\sum_{n=2}^{\infty} \left(\frac{1}{3^n \cos\frac{3}{2^n}}\right)^2$
6. $\sum_{n=1}^{\infty} \frac{n^2}{(n^2+5)5^n}$

10. variants.

1. $\sum_{n=3}^{\infty} \frac{1}{n^2-4}$
2. $\sum_{n=2}^{\infty} \frac{n^2+n+1}{n^3-1}$
3. $\sum_{n=1}^{\infty} \arcsin\frac{n^3}{n^3+4}$
4. $\sum_{n=1}^{\infty} \frac{1}{n} \ln\frac{n+1}{n-1}$
5. $\sum_{n=1}^{\infty} \frac{2^n}{1+2^{2n}}$
6. $\sum_{n=1}^{\infty} \frac{1}{\sqrt[n]{0,9}}$

11. variants.

1. $\sum_{n=1}^{\infty} \frac{2n+1}{n^2(n+1)^2}$
2. $\sum_{n=1}^{\infty} \frac{1}{n^2+3n-3}$
3. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{3n-1}+\sqrt{3n-1}}$
4. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} \sin\frac{1}{n}$
5. $\sum_{n=1}^{\infty} e^n \left(\frac{n}{n+1}\right)^{n^2+n}$
6. $\sum_{n=1}^{\infty} \frac{3+(-1)^n}{2^{n+2}}$

12. variants.

1. $\sum_{n=1}^{\infty} \frac{(n+3)^2-n^2}{n^2(n+3)^2}$
2. $\sum_{n=1}^{\infty} \frac{5}{3n-2}$
3. $\sum_{n=1}^{\infty} \frac{7}{(8+(-1)^n)^n}$
4. $\sum_{n=1}^{\infty} \frac{1}{arctg(n^2+n+1)}$
5. $\sum_{n=1}^{\infty} \left(1-\frac{\ln n}{n}\right)^n$
6. $\sum_{n=3}^{\infty} \frac{n^2+4n+4}{n^4-16}$

13. variants.

1. $\sum_{n=0}^{\infty}\left(\frac{3}{2^n}-\frac{1}{11^n}\right)$
2. $\sum_{n=1}^{\infty}\frac{1}{3n+555}$
3. $\sum_{n=1}^{\infty}\frac{n}{\sqrt{n^4+6n-2}}$
4. $\sum_{n=1}^{\infty} arcctg\left(\frac{1}{n^2+4}\right)$
5. $\sum_{n=1}^{\infty}\frac{11}{\ln n}$
6. $\sum_{n=1}^{\infty}\frac{11}{n11^n}$

14. variants.

1. $\sum_{n=1}^{\infty}\frac{4n+4}{n^2(n+2)^2}$
2. $\sum_{n=1}^{\infty}\frac{1}{\sqrt{(4n-3)(8n-7)}}$
3. $\sum_{n=1}^{\infty}\left(\frac{n}{n+1}\right)^n$
4. $\sum_{n=1}^{\infty}\frac{1}{\arccos\frac{1}{n^2+9}}$
5. $\sum_{n=1}^{\infty}\frac{7^n}{7+7^{2n}}$
6. $\sum_{n=3}^{\infty}\ln\frac{n^3+1}{(n+1)(n^2-n-1)}$

15. variants.

1. $\sum_{n=1}^{\infty}\frac{6n^2+12n+8}{n^3(n+2)^3}$
2. $\sum_{n=1}^{\infty}\frac{1}{1+0{,}7^n}$
3. $\sum_{n=3}^{\infty}\frac{\ln(n-2)}{\sqrt{n}}$
4. $\sum_{n=1}^{\infty}\frac{n^7+1}{n^9-2n+3}$
5. $\sum_{n=2}^{\infty}\left(\frac{1}{7^n\cos\frac{6}{7^n}}\right)^2$
6. $\sum_{n=2}^{\infty}\frac{n^2}{\sqrt{n^5+4n+3}}$

Otrais laboratorijas darbs par skaitļu rindām
Pozitīvu skaitļu rindas II

Noskaidrot dotās skaitļu rinads konverģenci vai diverģenci, izmantojot Dalambēra, Košī, kādu no salīdzināšanas pazīmēm vai Integrālpazīmi.

1. variants.

1. $\sum_{n=1}^{\infty} \left(arctg\sqrt{\frac{3n+2}{n+1}}\right)^n$
2. $\sum_{n=0}^{\infty} \frac{4\cdot 7\cdot 13\cdot \ldots \cdot (3n+4)}{3\cdot 7\cdot 11\cdot \ldots \cdot (4n+3)}$
3. $\sum_{n=1}^{\infty} ne^{-n^2}$
4. $\sum_{n=1}^{\infty} \left(\frac{n+1}{n}\right)^{n^2} 5^n$
5. $\sum_{n=1}^{\infty} \sqrt{n^{-3}} \arcsin \frac{1}{\sqrt{n}}$

2. variants.

1. $\sum_{n=1}^{\infty} \frac{3^n+n^2}{5^n+n}$
2. $\sum_{n=1}^{\infty} \frac{n!(2n+1)!}{(3n)!}$
3. $\sum_{n=2}^{\infty} \frac{1+n}{n^2-n}$
4. $\sum_{n=3}^{\infty} \frac{\ln n}{n^2}$
5. $\sum_{n=1}^{\infty} \frac{n!n^7}{(1+2)(2+2)\cdot \ldots \cdot (2n+2)}$

3. variants.

1. $\sum_{n=1}^{\infty} 2^{4n} \left(\frac{n}{n+2}\right)^{n^2}$
2. $\sum_{n=1}^{\infty} \frac{n^n}{n!3^n}$
3. $\sum_{n=1}^{\infty} \frac{n-1}{n^2+n}$
4. $\sum_{n=1}^{\infty} \left(arctg\sqrt{\frac{n+2}{3n+1}}\right)^n$
5. $\sum_{n=1}^{\infty} \frac{2^n(4n)!}{11\cdot 84\cdot \ldots \cdot (3n^4+4n^3+4)}$

4. variants.

1. $\sum_{n=1}^{\infty} \frac{n^8}{3^{\frac{n}{3}}}$
2. $\sum_{n=1}^{\infty} \frac{n^n \sin \frac{\pi}{2^n}}{n!}$
3. $\sum_{n=2}^{\infty} \frac{1}{n \ln^2 n}$
4. $\sum_{n=1}^{\infty} \frac{n\cdot n!}{(2n)!}$
5. $\sum_{n=1}^{\infty} \frac{2^n n^{n^2+1}}{3^n \left(n+\frac{1}{n}\right)^{n^2}}$

5. variants.

1. $\sum_{n=1}^{\infty} \left(\frac{n^2+4}{n^2+5}\right)^{n^3+1}$
2. $\sum_{n=1}^{\infty} \frac{3\cdot 6\cdot \ldots \cdot (3n)}{(n+1)!} arctg \frac{1}{2^n}$
3. $\sum_{n=1}^{\infty} \frac{5^{n-1}-2^{n-1}}{10^n}$
4. $\sum_{n=1}^{\infty} \frac{(2n)!}{(2^n)!}$
5. $\sum_{n=3}^{\infty} \frac{1}{n \ln n \cdot (\ln \ln n)}$

6. variants.

1. $\sum_{n=1}^{\infty} \left(\frac{n-2}{n+2}\right)^{n(n-1)}$
2. $\sum_{n=1}^{\infty} \frac{(2n-1)!!}{n!}$
3. $\sum_{n=1}^{\infty} \frac{1}{4^n} tg^2 \frac{\pi}{4^n}$
4. $\sum_{n=2}^{\infty} \frac{5}{n \ln^5 n}$
5. $\sum_{n=1}^{\infty} \frac{n^7(\sqrt{2}+(-1)^n)^n}{7^n}$

7. variants.

1. $\sum_{n=1}^{\infty} \left(\frac{n+1}{n}\right)^{n^2} \frac{1}{2^n}$
2. $\sum_{n=1}^{\infty} \frac{2\cdot 5\cdot 8\cdot \ldots \cdot (3n-1)}{1\cdot 5\cdot 9\cdot \ldots \cdot (4n-3)}$
3. $\sum_{n=1}^{\infty} n^{-\frac{2}{3}} arctg \frac{1}{\sqrt{n}}$
4. $\sum_{n=1}^{\infty} \frac{2n}{n^2+1}$
5. $\sum_{n=1}^{\infty} \frac{5^{3n+5}}{3^{5n+3}}$

8. variants.

1. $\sum_{n=1}^{\infty} \left(\frac{3n}{n+7}\right)^n \left(\frac{n+3}{n+4}\right)^{n^2}$
2. $\sum_{n=1}^{\infty} n^2 \prod_{k=1}^{n} \frac{\sin k\frac{\pi}{2}}{1+n^2+\cos^2 k\frac{\pi}{2}}$
3. $\sum_{n=1}^{\infty} \left(\frac{1+n}{1+n^2}\right)^2$
4. $\sum_{n=1}^{\infty} \frac{1}{n \ln^3 n}$
5. $\sum_{n=1}^{\infty} \frac{n^(n-1)}{(2n^2+n+1)^{\frac{n+1}{2}}}$

9. variants.

1. $\sum_{n=1}^{\infty} \frac{1}{3^n - n^3}$
2. $\sum_{n=1}^{\infty} \frac{n^5}{2^n}$
3. $\sum_{n=3}^{\infty} \frac{1}{n \ln n \cdot (\ln \ln n)^2}$
4. $\sum_{n=1}^{\infty} \left(1 - \cos^2 \frac{7}{n}\right)^n$
5. $\sum_{n=3}^{\infty} \frac{7^{3n}}{(2n-5)!}$

10. variants.

1. $\sum_{n=1}^{\infty} \frac{n^3(\sqrt{2}+(-1)^n)^n}{3^n}$
2. $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$
3. $\sum_{n=0}^{\infty} \frac{3^{2n+1}}{2^{3n-1}}$
4. $\sum_{n=1}^{\infty} \frac{n}{n^4 - 9}$
5. $\sum_{n=1}^{\infty} \arcsin^n \frac{1}{n}$

11. variants.

1. $\sum_{n=1}^{\infty} \frac{(3+(-1)^{n+1})^n}{2(3+(-1)^n)^n}$
2. $\sum_{n=1}^{\infty} \frac{n^4+2n^2+1}{2^n}$
3. $\sum_{n=0}^{\infty} \frac{1}{\sqrt{4n+1}}$
4. $\sum_{n=1}^{\infty} \left(\cos \frac{2}{n}\right)^{n^3}$
5. $\sum_{n=1}^{\infty} \frac{(2n-1)!}{n^n}$

12. variants.

1. $\sum_{n=5}^{\infty} \left(\frac{n-5}{n+5}\right)^{n(n+5)}$
2. $\sum_{n=3}^{\infty} \left(\frac{9+\cos n}{10+\cos n}\right)^{n-\ln n}$
3. $\sum_{n=1}^{\infty} ntg \frac{\pi}{2^{n+1}}$
4. $\sum_{n=1}^{\infty} \frac{5^{3n}}{(3n+1)!}$
5. $\sum_{n=1}^{\infty} \frac{4n-3}{\sqrt{n3^n}}$

13. variants.

1. $\sum\limits_{n=1}^{\infty} \frac{(n!)^2}{2^{n^2}}$
2. $\sum\limits_{n=1}^{\infty} \left(\cos \frac{7}{n}\right)^{n^3}$
3. $\sum\limits_{n=1}^{\infty} \left(\frac{n}{2n+1}\right)^{n}$
4. $\sum\limits_{n=1}^{\infty} \frac{1}{(n+1)\sqrt{n}}$
5. $\sum\limits_{n=0}^{\infty} \frac{3^n}{2^n(2n+1)}$

14. variants.

1. $\sum\limits_{n=1}^{\infty} \left(\frac{1+\cos n}{2+\cos n}\right)^{2n-\ln n}$
2. $\sum\limits_{n=1}^{\infty} \frac{4\cdot 7\cdot 10\cdot \ldots \cdot (3n+1)}{2\cdot 6\cdot 10\cdot \ldots \cdot (4n-2)}$
3. $\sum\limits_{n=1}^{\infty} \frac{10^n \cdot 2n!}{(2n)!}$
4. $\sum\limits_{n=2}^{\infty} \frac{1}{\sqrt[3]{(2n-3)^2}}$
5. $\sum\limits_{n=1}^{\infty} n^5 \left(\frac{3n+2}{4n+3}\right)^{n}$

15. variants.

1. $\sum\limits_{n=1}^{\infty} \left(\frac{n+1}{2n-1}\right)^{n}$
2. $\sum\limits_{n=1}^{\infty} \frac{2n-1}{\sqrt{2^n}}$
3. $\sum\limits_{n=1}^{\infty} n \sin \frac{\pi}{2^n}$
4. $\sum\limits_{n=1}^{\infty} n^2 e^{-n^3}$
5. $\sum\limits_{n=1}^{\infty} \frac{n!}{n^n}$

Trešais laboratorijas darbs par skaitļu rindām
(Maiņzīju rindas)

Noskaidrot maiņzīju rindu konverģenci vai diverģenci, un divām koverģentān rindām pēc izvēles, nokaidot vai tās konverģē absolūti vai nosacīti.

1. variants.

1. $\sum\limits_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt{n^2-3n+1}}$
2. $\sum\limits_{n=2}^{\infty} \frac{\ln^3 n}{n} \sin \frac{n}{4}$
3. $\sum\limits_{n=1}^{\infty} n\frac{(-1)^n arctgn}{\sqrt{n}}$
4. $\sum\limits_{n=1}^{\infty} \frac{n^2 \cdot (-2)^n}{3^n+1}$
5. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[4]{2n^3+3n-3}} \left(\frac{n+6}{n+1}\right)^{n+1}$

2. variants.

1. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n \ln n}{n}$
2. $\sum\limits_{n=2}^{\infty} \frac{1}{\ln^2 n} \cos \frac{n}{3}$
3. $\sum\limits_{n=2}^{\infty} \frac{(-1)^n \sin \frac{\pi}{n}}{\ln n}$
4. $\sum\limits_{n=2}^{\infty} \frac{(-1)^n}{n-\ln n}$
5. $\sum\limits_{n=1}^{\infty} n^3 \sin n \cdot e^{-\sqrt{n}}$

3. variants.

1. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n}{n+\sin^2 n}$
2. $\sum\limits_{n=1}^{\infty} \frac{\cos n \cos \frac{1}{n}}{\sqrt[4]{n}}$
3. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n n}{(n+1)\sqrt{n+2}} tg\frac{1}{\sqrt{n}}$
4. $\sum\limits_{n=1}^{\infty} \frac{\sin n}{2^n \cos^2 \frac{3}{2^n}}$
5. $\sum\limits_{n=1}^{\infty} \frac{(-n)^n}{(2n)!}$

4. variants.

1. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[3]{n+1}}$
2. $\sum\limits_{n=1}^{\infty} \frac{(1+n)\cos 2n}{\sqrt[3]{n^7+3n+4}}$
3. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n (n+2)}{\sqrt{n^3+8}} arctg\frac{\pi}{\sqrt{n}}$
4. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{2n+1}} \left(1+\frac{3}{n}\right)^n$
5. $\sum\limits_{n=1}^{\infty} (-1)^{\frac{n(n+1)}{2}} \cdot \frac{2^n+n^2}{3^n+n^3}$

5. variants.

1. $\sum_{n=1}^{\infty} \frac{(-1)^{n+3}}{\sqrt{3n^2-7n+5}}$
2. $\sum_{n=1}^{\infty} \frac{\sin 2n \ln^2(5n+1)}{(5n+1)^2}$
3. $\sum_{n=1}^{\infty} \frac{(-1)^{n+2} arctg\ n}{n^2-2n+3}$
4. $\sum_{n=1}^{\infty} \frac{(-1)^n \cdot n!}{7^n \cdot n^5}$
5. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{3n+1}} \left(1+\frac{7}{n}\right)^n$

6. variants.

1. $\sum_{n=1}^{\infty} \frac{(-1)^n}{2n+\cos^3 n}$
2. $\sum_{n=1}^{\infty} \frac{\sin n \cos \frac{1}{n}}{\sqrt{n}}$
3. $\sum_{n=1}^{\infty} \frac{(-1)^n \cdot n^2}{(\sqrt{n^3+2}} tg \frac{\pi}{\sqrt{3n}}$
4. $\sum_{n=1}^{\infty} \frac{\cos n}{18^n \sin^2 \frac{2}{3^n}}$
5. $\sum_{n=1}^{\infty} \frac{(-n)^n}{(3n)!}$

7. variants.

1. $\sum_{n=1}^{\infty} \frac{(-1)^n \ln(n+1)}{n}$
2. $\sum_{n=1}^{\infty} \frac{1}{\ln^2(n+1)} \sin(\frac{n}{2})$
3. $\sum_{n=1}^{\infty} \frac{(-1)^n \cos \frac{\pi}{n}}{\ln(n+1)}$
4. $\sum_{n=1}^{\infty} \frac{n^2 \cdot (-3)^n}{5^n+1}$
5. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n^2+2n-2}} \left(\frac{n+3}{n+2}\right)^{n+2}$

8. variants.

1. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n^2+2}}$
2. $\sum_{n=1}^{\infty} \frac{n \cos 3n}{\sqrt{n^3+3n+4}}$
3. $\sum_{n=1}^{\infty} \frac{(-1)^n (n+1)}{\sqrt{n^3+1}} arctg \frac{\pi}{n}$
4. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{3n+1}} \left(1+\frac{2}{n}\right)^n$
5. $\sum_{n=1}^{\infty} (-1)^n \frac{3^n+n^3}{5^n+n^5}$

9. variants.

1. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n \ln(n+2)}{n^2}$
2. $\sum\limits_{n=2}^{\infty} \frac{\ln^5 n}{n} \cos 7n$
3. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n arctg(5n)}{n}$
4. $\sum\limits_{n=1}^{\infty} \frac{n^2(-7n)^n}{11^n+2}$
5. $\sum\limits_{n=1}^{\infty} n \cdot e^{-\sqrt{n}} \cos n$

10. variants.

1. $\sum\limits_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt{n^2+n-2}}$
2. $\sum\limits_{n=2}^{\infty} \frac{\ln n}{n} \sin n$
3. $\sum\limits_{n=1}^{\infty} \frac{n^2(-5)^n}{7^n+1}$
4. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n arctg2n}{\sqrt[3]{n}}$
5. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[4]{2n^3-3n+4}} \left(\frac{n+1}{n+2}\right)^{n+2}$

11. variants.

1. $\sum\limits_{n=0}^{\infty} \frac{(-1)^n}{\sqrt[5]{n^7+1}}$
2. $\sum\limits_{n=2}^{\infty} \frac{n \sin n}{\sqrt{n^3-n}}$
3. $\sum\limits_{n=2}^{\infty} \frac{(-4)^n tg(\frac{\pi}{4^n})}{\pi \ln n}$
4. $\sum\limits_{n=2}^{\infty} \frac{\sin n \sin \frac{\pi}{2n}}{n \ln^2 n}$
5. $\sum\limits_{n=1}^{\infty} \ln\left(\frac{n+5}{n+3}\right)^n \cdot \frac{(-1)^n}{\sqrt{n}}$

12. variants.

1. $\sum\limits_{n=0}^{\infty} \frac{(-1)^n}{\sqrt[3]{n^4+3}}$
2. $\sum\limits_{n=2}^{\infty} \frac{\ln n \cos 5n}{n}$
3. $\sum\limits_{n=2}^{\infty} \frac{(-arctg5n)^n}{2^n}$
4. $\sum\limits_{n=2}^{\infty} \frac{(-1)^n \sin \frac{\pi}{3n}}{\sqrt{n}}$
5. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n \cdot n^2}{\sqrt[3]{3n^7}} \ln\left(\frac{n+2}{n+1}\right)$

13. variants.

1. $\sum\limits_{n=0}^{\infty} \frac{(-1)^n n}{\sqrt{n^3+n^2+n+1}}$
2. $\sum\limits_{n=2}^{\infty} \frac{\ln n \sin 3n}{n^2}$
3. $\sum\limits_{n=2}^{\infty} \frac{(-1)^n \sin \frac{3}{n}}{\ln n}$
4. $\sum\limits_{n=2}^{\infty} \frac{(-2arctg4n)^n}{5^n}$
5. $\sum\limits_{n=1}^{\infty} \frac{n}{\sqrt[4]{n^7}} \left(\frac{5-n}{n+5}\right)^n$

14. variants.

1. $\sum\limits_{n=4}^{\infty} \frac{(-1)^n}{\sqrt{n-3}}$
2. $\sum\limits_{n=2}^{\infty} \frac{arctn2n \sin 2n}{\sqrt[3]{n^2}}$
3. $\sum\limits_{n=2}^{\infty} \frac{1}{n \ln n} \left(\frac{3-n}{n+1}\right)^n$
4. $\sum\limits_{n=2}^{\infty} \frac{(-1)^n \cos \frac{\pi}{3^n}}{\sqrt[7]{n}}$
5. $\sum\limits_{n=1}^{\infty} \frac{5^n \cos 2n}{n!}$

15. variants.

1. $\sum\limits_{n=4}^{\infty} \frac{(-1)^{n+1} n^2}{\sqrt[3]{n^7+5}}$
2. $\sum\limits_{n=2}^{\infty} \frac{\sin n \cos \frac{1}{n}}{\ln n}$
3. $\sum\limits_{n=2}^{\infty} \frac{1}{\sqrt{n}} \left(\frac{2-n}{n+2}\right)^n$
4. $\sum\limits_{n=2}^{\infty} \frac{3^n \cos 7n}{n!}$
5. $\sum\limits_{n=1}^{\infty} \frac{(-1)^n tg \frac{1}{2n}}{n \sin \frac{1}{n}}$