1) $$\sum_{n=0}^{\infty}\left(\frac{3}{2^n}+\frac{(-1)^n}{2\cdot 3^n}\right)=\sum_{n=0}^{\infty}\left(3\cdot\frac{1}{2^n}+\frac{1}{2}\cdot(-1)^n\left(\frac{1}{3^n}\right)\right)=$$

$$=3\sum_{n=0}^{\infty}(1/2^n)+\frac{1}{2}\sum_{n=0}^{\infty}\left((-1/3)^n\right)=3\cdot\frac{1}{1-1/2}+\frac{1}{2}\cdot\frac{1}{1+1/3}=6\,3/8$$

2) $$\sum_{n=1}^{\infty}\frac{1}{36n^2-24n-5}=\sum_{n=1}^{\infty}\frac{1}{(6n+1)(6n-5)}=\frac{1}{6}\sum_{n=1}^{\infty}\left(\frac{1}{6n-5}-\frac{1}{6n+1}\right)=$$

$$=\frac{1}{6}\sum\left[1-\cancel{1/7},\ \cancel{1/7}-\cancel{1/13},\ \dots\ \cancel{1/(6n-5)}-1/(6n+1)\right]=$$

$$=\frac{1}{6}\lim_{n\to\infty}\left(1-1/(6n+1)\right)=1/6$$

$$D=24^2+4\cdot 36\cdot 5=$$

$$=6^2(4^2+4\cdot 5)=6^2\cdot 2^2\cdot 3^2=6^4$$

$$n_{1,2}=\frac{24\pm 36}{2\cdot 36}\quad \left[\begin{array}{l} n=\frac{60}{2\cdot 36}=5/6 \\ n=-\frac{12}{2\cdot 36}=-1/6\end{array}\right.$$

3)

1) $$\sum_{n=1}^{\infty}\frac{2n^3-5n^2+4n-1}{n^4+10n^2+3}\sim\sum\frac{1}{n}\text{ - расход.}$$

2) $$\sum_{n=1}^{\infty}\frac{\operatorname{arctg} n}{n^2+1}\le\sum_{n=1}^{\infty}\frac{1}{n^2+1}\le\sum_{n=1}^{\infty}\frac{1}{n^2}\text{ - сход.}$$

3) $$\sum_{n=1}^{\infty}\sin\frac{2n+1}{n^3+5n+3}\sim\frac{1}{n^2}\text{ - сход.}$$

4) $$\sum_{n=1}^{\infty}\ln\left(1+\frac{1}{n\sqrt[3]{n}}\right)\sim\sum\frac{1}{n\sqrt[3]{n}}\text{ - сход.}$$

5) $$\sum_{n=1}^{\infty}\frac{\sin^2 n}{(\ln 3)^n}\le\sum\frac{1}{(\ln 3)^n}\text{ - сход.}$$

6) $$\sum_{n=1}^{\infty}\ln(1/n)=\text{ расход.}$$

7) $$\sum_{n=1}^{\infty}\frac{1}{1+\ln n}=\text{ расход.}$$

4) $$\sum_{n=2}^{\infty}\frac{(\ln n)^{1000}}{n^{1.001}}=$$

5)

- $$\frac{2n^{n+1}\cdot \cancel{2^{2n}}\cdot\cancel{(n+1)!}}{4\cdot\cancel{2^n}\cdot\cancel{n!}\,(2n+1)}=\lim\frac{2n+1}{4n}=1/2$$

- $$\lim\left(\frac{2\sqrt{n}}{\sqrt{n}+3n^{1/3}}\right)^{n^{1/2}}=2$$

- $$\lim\ \frac{2n!}{n!\cdot n!}\quad\frac{(2n+2)!}{(n+1)!^2}=\frac{(2n+1)(2n+2)}{(n+1)^2}=4$$

- -1

- $$\lim\frac{-n}{(2^n)^2}=$$

- $1/2,\ (1/2)^2,\ (1/2)^6,\ (1/2)^{24}\ \dots$