1) $\sum_{k=4}^{\infty} \frac{2^{3k+1}}{2 \cdot k!}$

2) $\sum_{k=4}^{\infty} 2 \cdot \left(\frac{3}{2k}\right)^2$

Wert ?

3) $42 \cdot \sum_{k=1}^{\infty} \frac{k \cdot (1 + \sin(k^2))}{7 \cdot (2k+1)^k}$

4) $\sum \frac{k^2}{\sqrt{(2k)!}}$

Konvergenz ?

5) $\lim_{x \to (-3)} \left[\frac{5 \cdot (x+5) - 10}{\sqrt{7-3x} - (1-x)} \right]$ 2 Arten

1) $$\sum_{k=4}^{\infty} \frac{2^{3k+1}}{2k!} = \sum_{k=4}^{\infty} \frac{(2^3)^k \cdot \cancel{2^1}}{\cancel{2} \cdot k!} = \sum_{k=4}^{\infty} \frac{8^k}{k!}$$

$$\sum_{k=4}^{\infty} \frac{8^k}{k!} = \underbrace{\sum_{k=0}^{\infty} \frac{8^k}{k!}}_{e^8} - \left[\frac{8^0}{0!} + \frac{8^1}{1!} + \frac{8^2}{2!} + \frac{8^3}{3!} \right]$$

$$e^8 - \left[1 + 8 + 32 + \frac{512}{6} \right]$$

$$e^8 - \left[\frac{123}{3} + \frac{256}{3} \right]$$

$$e^8 - \frac{379}{3}$$

2) $$\sum_{k=4}^{\infty} 2\cdot\frac{9}{4k^2} = \frac{9}{2}\cdot\sum_{k=4}^{\infty} 1/k^2$$

$$\frac{9}{2}\cdot\left[\sum_{k=1}^{\infty} 1/k^2 - \left[\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}\right]\right]$$

$$\frac{9}{2}\cdot\left[\frac{\pi^2}{6} - \left(1+\frac{1}{4}+\frac{1}{9}\right)\right] = \frac{9}{2}\cdot\left(\frac{\pi^2}{6} - \frac{36+9+4}{36}\right)$$

$$\frac{9}{2}\cdot\left(\frac{\pi^2}{6} - \frac{49}{36}\right) = \frac{9\pi^2}{12} - \frac{49}{8}$$

4) <u>Wurzelsatz</u>:

$$\lim_{k\to\infty}\sqrt[k]{\frac{k\cdot(1+\sin(k^2))}{7\cdot(2k+1)^k}} = \left[\frac{\sqrt[k]{k}\cdot\sqrt[k]{[0;2]}}{\sqrt[k]{7}\cdot\sqrt[k]{(2k+1)^k}}\right]$$

$$\frac{1\cdot[0;1]}{1\cdot(2k+1)} = 0 < 1 \quad \checkmark$$

4) Quotientensatz:

$$\lim_{k\to\infty} \frac{(k+1)^2}{\sqrt{2\cdot(k+1)!}} \frac{\sqrt{(2k)!}}{k^2} = \lim_{k\to\infty} \left(\frac{k+1}{k}\right)^2 \cdot \sqrt{\frac{(2k)!}{(2k+2)!}}$$

$$\lim_{k\to\infty} \underbrace{\left(1+\frac{1}{k}\right)^2}_{1} \cdot \underbrace{\sqrt{\frac{\cancel{(2k)!}}{(2k+2)(2k+1)\cancel{(2k)!}}}}_{0} = 0 < 1 \checkmark$$

5) $$\lim_{x\to(-2)} \frac{3(x+4)-6}{\sqrt{2x+8}-(3x+8)} = \lim_{x\to(-2)} \frac{3x+6}{\sqrt{2x+8}-(3x+8)} = \frac{0}{0}$$

$$\frac{3\cdot(x+2)}{\sqrt{2x+8}-(3x+8)} \cdot \frac{\sqrt{2x+8}+(3x+8)}{\sqrt{2x+8}+(3x+8)}$$

$$\frac{3\cdot(x+2)\cdot\left[\sqrt{2x+8}+(3x+8)\right]}{2x+8-(3x+8)^2}$$

$$\frac{3\cdot\overline{(x+2)}\cdot\left[\sqrt{2x+8}+(3x+8)\right]}{2x+8-(9x^2+48x+64)}$$

$$-9x^2-46x-56$$

$$-(x+2)\quad(9x+28)=-\left[9x^2+\underbrace{18x+28x}_{46x}+56\right]$$

$$\Rightarrow\frac{3\cdot\left(\sqrt{2x+8}+(3x+8)\right]}{-(9x+28)}=\frac{3\cdot\left(\sqrt{4}+2\right)}{-10}$$

$$=-1{,}2=-\frac{12}{10}$$

$$\lim_{x\to(-2)}\frac{3x+6}{\sqrt{2x+8}-(3x+8)}=\lim_{x\to(-2)}\frac{3}{\frac{1}{-2\cdot\sqrt{2x+8}}\cdot 2-3}=\frac{3}{\frac{1}{2}-3}$$

$$=-6/5$$