1210. a) $\lim\limits_{n\to\infty}\frac{(n+1)^3-(n-1)^3}{(n+1)^2+(n-1)^2}=\lim\limits_{n\to\infty}\frac{n^3+3\cdot n^2+3\cdot n+1-(n^3-3\cdot n^2+3\cdot n-1)}{n^2+2\cdot n+1+n^2-2\cdot n+1}=$

$\lim\limits_{n\to\infty}\frac{n^3+3\cdot n^2+3\cdot n+1-n^3+3\cdot n^2-3\cdot n+1}{n^2+2\cdot n+1+n^2-2\cdot n+1}=\lim\limits_{n\to\infty}\frac{6\cdot n^2+2}{2\cdot n^2+2}=$

$\lim\limits_{n\to\infty}\frac{6+2\cdot\frac{1}{n^2}}{2+2\cdot\frac{1}{n^2}}=\frac{\lim\limits_{n\to\infty}6+2\cdot\lim\limits_{n\to\infty}\frac{1}{n^2}}{\lim\limits_{n\to\infty}2+2\cdot\lim\limits_{n\to\infty}\frac{1}{n^2}}=\frac{6+2\cdot 0}{2+2\cdot 0}=\frac{6}{2}=3$

v) $\lim\limits_{n\to\infty}\left(\frac{2\cdot n^2}{2\cdot n+3}+\frac{1-n^3}{3\cdot n^2+1}\right)=\lim\limits_{n\to\infty}\frac{2\cdot n^2\cdot(3\cdot n^2+1)+(1-n^3)\cdot(2\cdot n+3)}{(2\cdot n+3)\cdot(3\cdot n^2+1)}=$

$\lim\limits_{n\to\infty}\frac{6\cdot n^4+2\cdot n^2+2\cdot n+3-6\cdot n^4-9\cdot n^3}{6\cdot n^3+2\cdot n+9\cdot n^2+3}=$

$\lim\limits_{n\to\infty}\frac{-9\cdot n^3+2\cdot n^2+2\cdot n+3}{6\cdot n^3+9\cdot n^2+2\cdot n+3}=\lim\limits_{n\to\infty}\frac{-9+2\cdot\frac{1}{n}+2\cdot\frac{1}{n^2}+3\cdot\frac{1}{n^3}}{6+9\cdot\frac{1}{n}+2\cdot\frac{1}{n^2}+3\cdot\frac{1}{n^3}}=$

$\lim\limits_{n\to\infty}\frac{\lim\limits_{n\to\infty}(-9)+2\cdot\lim\limits_{n\to\infty}\frac{1}{n}+2\cdot\lim\limits_{n\to\infty}\frac{1}{n^2}+3\cdot\lim\limits_{n\to\infty}\frac{1}{n^3}}{\lim\limits_{n\to\infty}6+9\cdot\lim\limits_{n\to\infty}\frac{1}{n}+2\cdot\lim\limits_{n\to\infty}\frac{1}{n^2}+3\cdot\lim\limits_{n\to\infty}\frac{1}{n^3}}=-\frac{9}{6}=-\frac{3}{2}$

1211. b) $\lim\limits_{n\to\infty}\frac{(n+2)!-(n+1)!}{(n+3)!}=\lim\limits_{n\to\infty}\frac{(n+2)\cdot n!-(n+1)\cdot n!}{(n+3)\cdot n!}=\lim\limits_{n\to\infty}\frac{n!\cdot(n+2-n-1)}{n!\cdot(n+3)}=$

$\lim\limits_{n\to\infty}\frac{1}{n+3}=\lim\limits_{n\to\infty}\frac{\frac{1}{n}}{1+3\cdot\frac{1}{n}}=\frac{\lim\limits_{n\to\infty}\frac{1}{n}}{\lim\limits_{n\to\infty}1+3\cdot\lim\limits_{n\to\infty}\frac{1}{n}}=\frac{0}{1+0}=0$

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

1213. đ) $\lim\limits_{n\to\infty}\left(\frac{\overbrace{1+5+9+\cdots+(4\cdot n-3)}}{2\cdot(n+1)}-n\right)=\lim\limits_{n\to\infty}\left(\frac{2\cdot n^2-n}{2\cdot n+2}-n\right)=$

$\lim\limits_{n\to\infty}\frac{2\cdot n^2-n-n\cdot(2\cdot n+2)}{2\cdot n+2}=$

$\lim\limits_{n\to\infty}\frac{2\cdot n^2-n-2\cdot n^2-2\cdot n}{2\cdot n+2}=\lim\limits_{n\to\infty}\frac{-3\cdot n}{2\cdot n+2}=\lim\limits_{n\to\infty}\frac{-3}{2+2\cdot\frac{1}{n}}=\frac{\lim\limits_{n\to\infty}(-3)}{\lim\limits_{n\to\infty}2+2\cdot\lim\limits_{n\to\infty}\frac{1}{n}}=\frac{-3}{2+2\cdot o}=$

$-\frac{3}{2}$

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