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

$$\lim_{n\to\infty}\frac{n^3+3n^2+3n+1-(n^3-3n^2+3n-1)}{n^2+2n+1+n^2-2n+1}=$$

$$\lim_{n\to\infty}\frac{n^3+3n^2+3n+1-n^3+3n^2-3n+1}{2n^2+2}=$$

$$\lim_{n\to\infty}\frac{6n^2+2}{2n^2+2}=$$

$$\lim_{n\to\infty}\frac{\cancel{2}(3n^2+1)}{\cancel{2}(n^2+1)}=$$

$$\lim_{n\to\infty}\frac{3n^2+1\ \ /:n^2}{n^2+1\ \ /:n^2}=$$

$$\lim_{n\to\infty}\frac{3+\frac{1}{n^2}}{1+\frac{1}{n^2}}=\frac{3+0}{1+0}=3$$

1210. v) $\lim_{n\to\infty}(\frac{2n^2}{2n+3}+\frac{1-3n^3}{3n^2+1})=$

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

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

$$\lim_{n\to\infty}\frac{-9n^3+2n^2+2n+3\ /:n^3}{6n^3+9n^2+2n+3\ /:n^3}=$$

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

$$\lim_{n\to\infty}\frac{-9+2\cdot0+2\cdot0+3\cdot\frac{1}{n^3}}{6+9\cdot0+2\cdot0+3\cdot\frac{1}{n^3}}=\frac{-9}{6}=-\frac{3}{2}$$

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

$\lim_{n\to\infty}\frac{(n+2)(n+1)!-(n+1)!}{(n+3)(n+2)(n+1)!}=$

$\lim_{n\to\infty}\frac{\cancel{(n+1)!}\cdot(n+2-1)}{(n+3)(n+2)\cancel{(n+1)!}}=$

$\lim_{n\to\infty}\frac{n+1}{n^2+2n+3n+6}=$

$\lim_{n\to\infty}\frac{n+1\ /:n^2}{n^2+5n+6\ /:n^2}=$

$\lim_{n\to\infty}\frac{\frac{1}{n}+\frac{1}{n^2}}{5\cdot\frac{1}{n}+6\cdot\frac{1}{n^2}}=\frac{0+0}{5\cdot0+6\cdot0}=\mathbf{0}$

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

$Sn=\frac{n}{2}\cdot(a_1+a_n)=$

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

$=\frac{n}{2}\cdot(4n-2)=$

$=\frac{2n\cdot(2n-1)}{2}=$

$=n\cdot(2n-1)=2n^2-n$

$\lim_{n\to\infty}\frac{2n^2-n-2n\cdot(n+1)}{2\cdot(n+1)}=$

$\lim_{n\to\infty}\frac{\cancel{2n^2}-n-\cancel{2n^2}-2n}{2n+2}=$

$\lim_{n\to\infty}\frac{-3n\ /:n}{2n+2\ /:n}=$

$\lim_{n\to\infty}\frac{-3}{2+2\cdot\frac{1}{n}}=\frac{-3}{2+2\cdot0}=-\frac{3}{2}$