1) $x_n = n^{(-1)^n}$

$x_1 < x$, $x_2 > x_3$

$x_1 = 1$ $x_2 = 2$ $x_3 = \frac{1}{3}$ $x_4 = 4$

$0 < n^{(-1)^n}$

Последовательность ограничена

2) $\sin n$

$\sin(n+1) + \sin(n-1) = 2 \sin n \cos 1$

$\sin(n+1) - \sin(n-1) = 2 \cos n \sin 1$

3) $\lim\limits_{n\to\infty} \frac{10n}{n^2+1} = \lim\limits_{n\to\infty} \frac{\frac{10}{n}}{1+\frac{1}{n^2}} \to 0 = 0$

$\lim\limits_{n\to\infty} \frac{n^2-n}{n-\sqrt{n}} = \lim\limits_{n\to\infty} \frac{1-\frac{1}{n}}{\frac{1}{n}-n^{-\frac{1}{2}}} = \lim\limits_{n\to\infty} \frac{1-\frac{1}{n}}{\frac{1}{n}-\frac{1}{\sqrt{n}}} \to 0 = \infty$

$\to 0$

$\lim\limits_{n\to\infty} \frac{5 \cdot 3^n}{3^n - 2} = \frac{5}{\frac{3^n}{3^n} - \frac{2}{3^n}} \to 0 = 0$

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

$= \frac{n}{n(\sqrt{1+\frac{1}{n}} + 1)} = \frac{1}{\sqrt{1}+1} = \frac{1}{2}$

$\to 0$

5) $\lim\limits_{n\to\infty} \frac{\sqrt{n}\cos n}{n+1} = 0$