Find the limit of following sequences:

1. $a_n = \sqrt{n+2} - \sqrt{n+5}$
2. $a_n = n(\sqrt{n^2-2n} - \sqrt{n^2-3})$
3. $a_n = n - \sqrt{n(n-1)}$

More complicated limits

4. $\lim\limits_{n\to\infty} \frac{n+\cos(n!)}{2n+1}$
5. $\lim\limits_{n\to\infty} \frac{\arctan(n^2)}{n+1}$

Functions

1. Are the following functions odd or even?
   (a) $f(x) = \sin(x^2) + |x|$
   (b) $f(x) = \tan(4x)$
   (c) $f(x) = x + x^2$
2. Are the following functions periodic?
   (a) $f(x) = \cos^2(\frac{x}{2})$
   (b) $f(x) = \arctan(\tan(x))$
   (c) $f(x) = \tan(\arctan(x))$

(3.) Sketch a graph of a given function, find its Domain of definition and Range:

1. $f(x) = (x-3)^2$
2. $f(x) = e^{-x/2}$
3. $f(x) = |x| + 5$
4. $f(x) = \ln(x+1) + 2$
5. $f(x) = \arctan(x)$
6. $f(x) = 2\arctan(x) + \pi$
7. $f(x) = \arccos(\frac{x}{2}) - \frac{\pi}{2}$
8. $f(x) = \arcsin(x-5)$

Find (a) Domain of definition ($\mathcal{D}(f)$) and Range of the given function, (b) compute limits in boundary points of $\mathcal{D}(f)$.

1. $f(x) = \ln(x - \sqrt{x+1})$
2. $f(x) = \arccos \frac{1-2x}{4}$
3. $f(x) = \ln(x+3) + \sqrt{5-2x}$