

**Домашна работа № 2**  
**на Петър Парушев с ФН 61620, група 1, СИ**

**Задача 1.**

$$\lim_{n \rightarrow \infty} \frac{\sqrt{n-1}-\sqrt{n+2}}{\sqrt{n+4}-\sqrt{n+3}} \sim \frac{\sqrt{n-1}-\sqrt{n+2}}{\sqrt{n+4}-\sqrt{n+3}} \frac{\sqrt{n-1}+\sqrt{n+2}}{\sqrt{n-1}+\sqrt{n+2}} \frac{\sqrt{n+4}+\sqrt{n+3}}{\sqrt{n+4}+\sqrt{n+3}} \sim -3 \frac{\sqrt{n+4}+\sqrt{n+3}}{\sqrt{n-1}+\sqrt{n+2}} = -3 \frac{2}{2} = -3$$

**Задача 2.**

$$\lim_{n \rightarrow -2} \frac{\sqrt{x^3-x+16}-\sqrt{8-x}}{x^2+8x+12} \sim \frac{x^3+8}{2\sqrt{10}(x+2)(x+6)} \sim \frac{(x+2)(x^2+2x+4)}{2\sqrt{10}(x+2)(x+6)} \sim \frac{(x^2+2x+4)}{2\sqrt{10}(x+6)} = \frac{3\sqrt{10}}{20}$$

**Задача 3.**

$$\lim_{n \rightarrow \infty} \left( \frac{n^2 - 3n + 2}{n^2 + 3n + 2} \right)^n$$

Полагаме  $x = \frac{1}{n}$ .

$$\lim_{n \rightarrow \infty} \left( \frac{n^2 - 3n + 2}{n^2 + 3n + 2} \right)^n = \lim_{x \rightarrow 0} \left( \frac{x^2 - 3x + 2}{x^2 + 3x + 2} \right)^{\frac{1}{x}}$$

$$\ln \lim_{x \rightarrow 0} \left( \frac{x^2 - 3x + 2}{x^2 + 3x + 2} \right)^{\frac{1}{x}} = \lim_{x \rightarrow 0} \ln \left( \frac{x^2 - 3x + 2}{x^2 + 3x + 2} \right)^{\frac{1}{x}} = \lim_{x \rightarrow 0} \frac{\ln \left( \frac{x^2 - 3x + 2}{x^2 + 3x + 2} \right)}{x} = \lim_{x \rightarrow 0} \frac{\ln \left( 1 - \frac{6x}{x^2 + 3x + 2} \right)}{x} = \lim_{x \rightarrow 0} \frac{\frac{6x}{x^2 + 3x + 2}}{x} = -6 \Rightarrow$$

$$\lim_{n \rightarrow \infty} \left( \frac{n^2 - 3n + 2}{n^2 + 3n + 2} \right)^n = e^{-6}$$

**Задача 4.**

$$\lim_{x \rightarrow 3} \frac{1}{x-3} - \frac{27}{x^3-27} \sim \frac{1}{x-3} - \frac{27}{(x-3)(x^2+3x+9)} \sim \frac{x^2+3x-18}{(x-3)(x^2+3x+9)} \sim \frac{(x-3)(x+6)}{(x-3)(x^2+3x+9)} = \frac{9}{27} = \frac{1}{3}$$