12 Найти предел последовательности

$$\lim_{n\to\infty} \frac{(97-2n)^3}{2n(3n^2+15)+8n} = (1)$$

$$(97-2n)^3 = n^3\left(\frac{97}{n}-2\right)^3 = n^3\left(-2+\frac{97}{n}\right)^3$$

$$2n(3n^2+15)+8n = 2n\,n^2\left(3+\frac{15}{n^2}\right)+8n =$$

$$= 2n^3\left(3+\frac{15}{n^2}\right)+8n = n^3\left(2\left(3+\frac{15}{n^2}\right)+\frac{8n}{n^3}\right) =$$

$$= n^3\left(2\left(3+\frac{15}{n^2}\right)+\frac{8}{n^2}\right)$$

$$\frac{(97-2n)^3}{2n(3n^2+15)+8n} = \frac{n^3\left(-2+\frac{97}{n}\right)^3}{n^3\left(2\left(3+\frac{15}{n^2}\right)+\frac{8}{n^2}\right)} =$$

$$= \frac{\left(-2+\frac{97}{n}\right)^3}{2\left(3+\frac{15}{n^2}\right)+\frac{8}{n^2}}$$

$$(1) = \lim_{n\to\infty} \frac{\left(-2+\frac{97}{n}\right)^3}{2\left(3+\frac{15}{n^2}\right)+\frac{8}{n^2}} =$$

$$= \frac{\left(-2+97\lim\limits_{n\to\infty}\frac{1}{n}\right)^3}{2\left(3+15\lim\limits_{n\to\infty}\frac{1}{n^2}\right)+8\lim\limits_{n\to\infty}\frac{1}{n^2}} =$$

$$= \frac{(-2+97\cdot 0)^3}{2(3+15\cdot 0)+8\cdot 0} = \frac{(-2+0)^3}{2\cdot(3+0)+0} = \frac{(-2)^3}{2\cdot 3} = -\frac{4}{3}$$

Ответ: $\boxed{\lim\limits_{n\to\infty} \frac{(97-2n)^3}{2n(3n^2+15)+8n} = -\frac{4}{3}}$