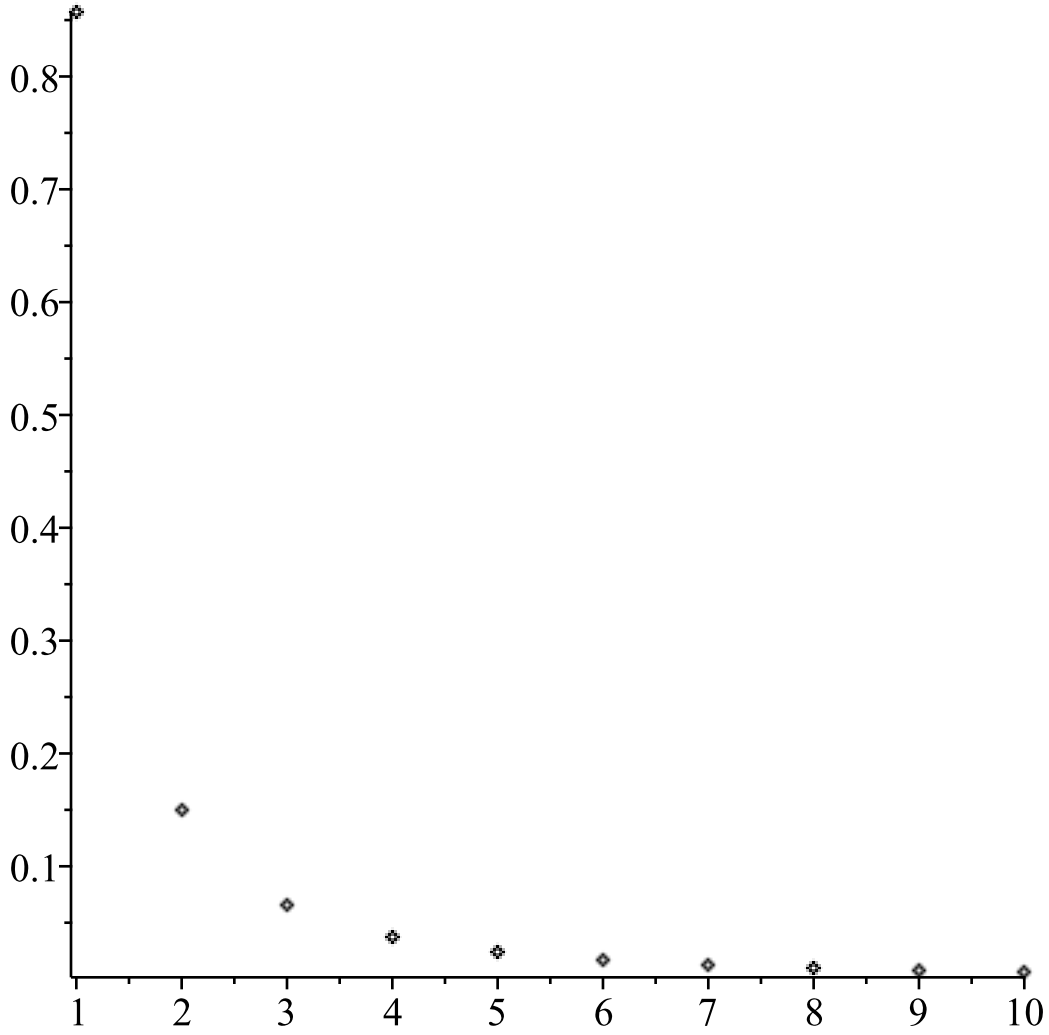
#Лабораторная работа 1, Басенко Кирилл, вариант 3

#task1
#1)

$$an := n \to \frac{6}{9\,n^2 + 6\,n - 8} :$$

$$r := 1..10 :$$

$$plots[pointplot](\{seq([n, an(n)], n = r)\});$$



$$limit(an(n), n = \text{infinity});$$

$$0 \tag{1}$$

$$\text{alpha} := 0.1 :$$

$$convert(an(n), parfrac);$$

$$-\frac{1}{3\,n + 4} + \frac{1}{3\,n - 2} \tag{2}$$

$$sn := n \to sum(an(i), i = 1..n) :$$

$$s := sn(\text{infinity});$$

$$s := \frac{5}{4} \tag{3}$$

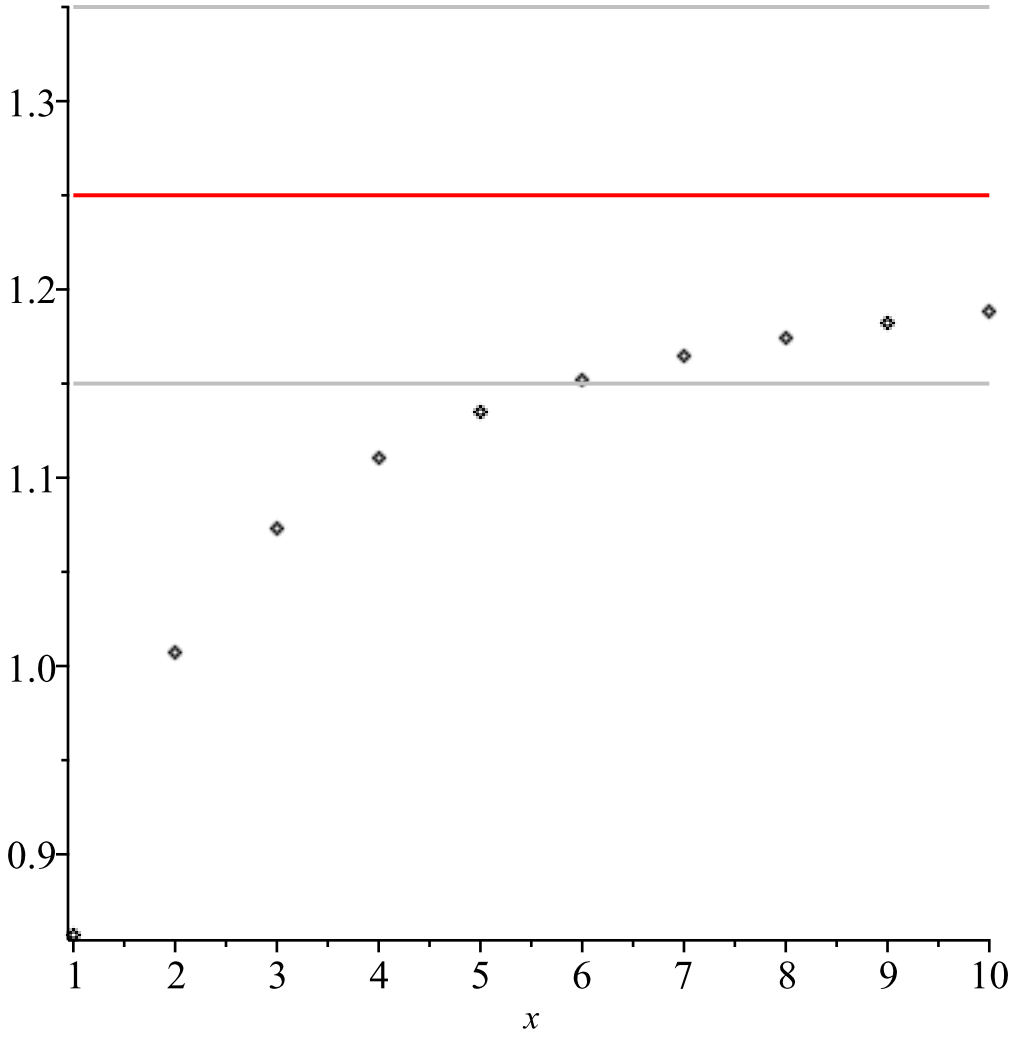
$$sn(k);$$

$$-\frac{1}{3\left(k+\frac{1}{3}\right)}-\frac{1}{3\left(k+\frac{4}{3}\right)}+\frac{5}{4} \tag{4}$$

$solve(\{|s-sn(k)| \le \text{alpha}, k \ge 1\}, k);$

$$\{5.870624736 \le k\} \tag{5}$$

$p\_e := plot([s, s-\text{alpha}, s+\text{alpha}], x=r, color=[red, gray, gray]):$
$p\_s := plots[pointplot](\{seq([k, sn(k)], k=r)\}):$
$plots[display](p\_s, p\_e);$



#2)

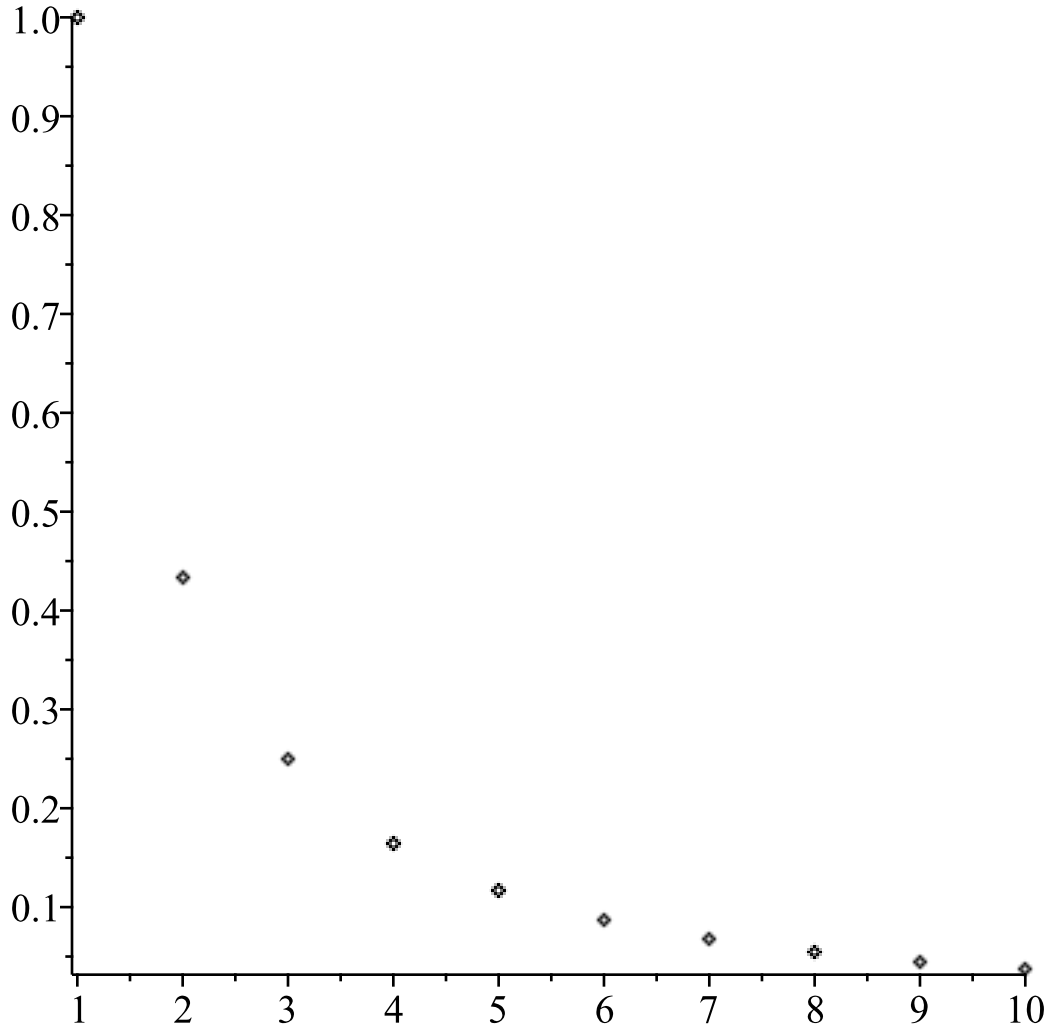
restart :

$an := n \to \frac{5n+3}{n\cdot(n+1)\cdot(n+3)}$:

alpha := 0.1 :

$r := 1..10$:

$plots[pointplot](\{seq([n, an(n)], n=r)\});$



$limit(an(k), k = \text{infinity});$

$$0 \tag{6}$$

$convert(an(n), parfrac);$

$$\frac{1}{n+1} + \frac{1}{n} - \frac{2}{n+3} \tag{7}$$

$sn := n \rightarrow sum(an(i), i = 1 .. n) :$
$s := sn(\text{infinity});$

$$s := \frac{8}{3} \tag{8}$$

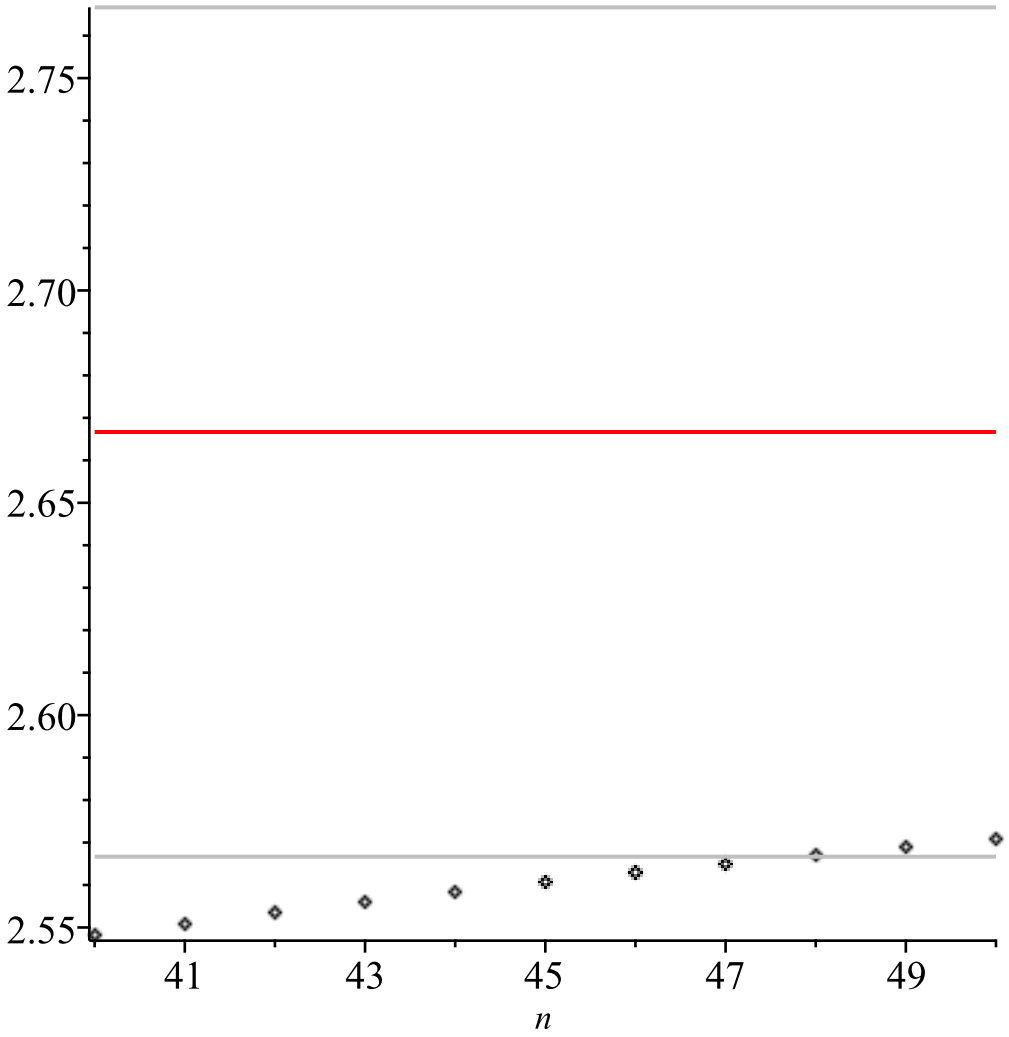
$sn(k);$

$$-\frac{1}{k+1} - \frac{2}{k+2} - \frac{2}{k+3} + \frac{8}{3} \tag{9}$$

$solve(\{|s - sn(k)| \le \text{alpha}, k \ge 1\}, k);$

$$\{47.81125721 \le k\} \tag{10}$$

$r := 40 ..50 :$
$p\_e := plot([s, s - \text{alpha}, s + \text{alpha}], n = r, color = [red, gray, gray]) :$
$p\_s := plots[pointplot](\{seq([k, sn(k)], k = r)\}) :$
$plots[display](p\_s, p\_e);$



#task2

restatrt :

$$aabs := n \to \frac{1}{(2 \cdot n)^3} :$$

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

$$Sn := n \to sum(a(k), k = 1..n) :$$

$$Sn(\text{infinity}) :$$

$$S := evalf(\%);$$

$$S := 0.1126928347 \quad \textbf{(11)}$$

$$limit(aabs(n), n = \text{infinity});$$

$$diff(aabs(n), n);$$

$$0$$

$$-\frac{3}{8 n^4} \quad \textbf{(12)}$$

$$int(aabs(k), k = 1..\text{infinity});$$

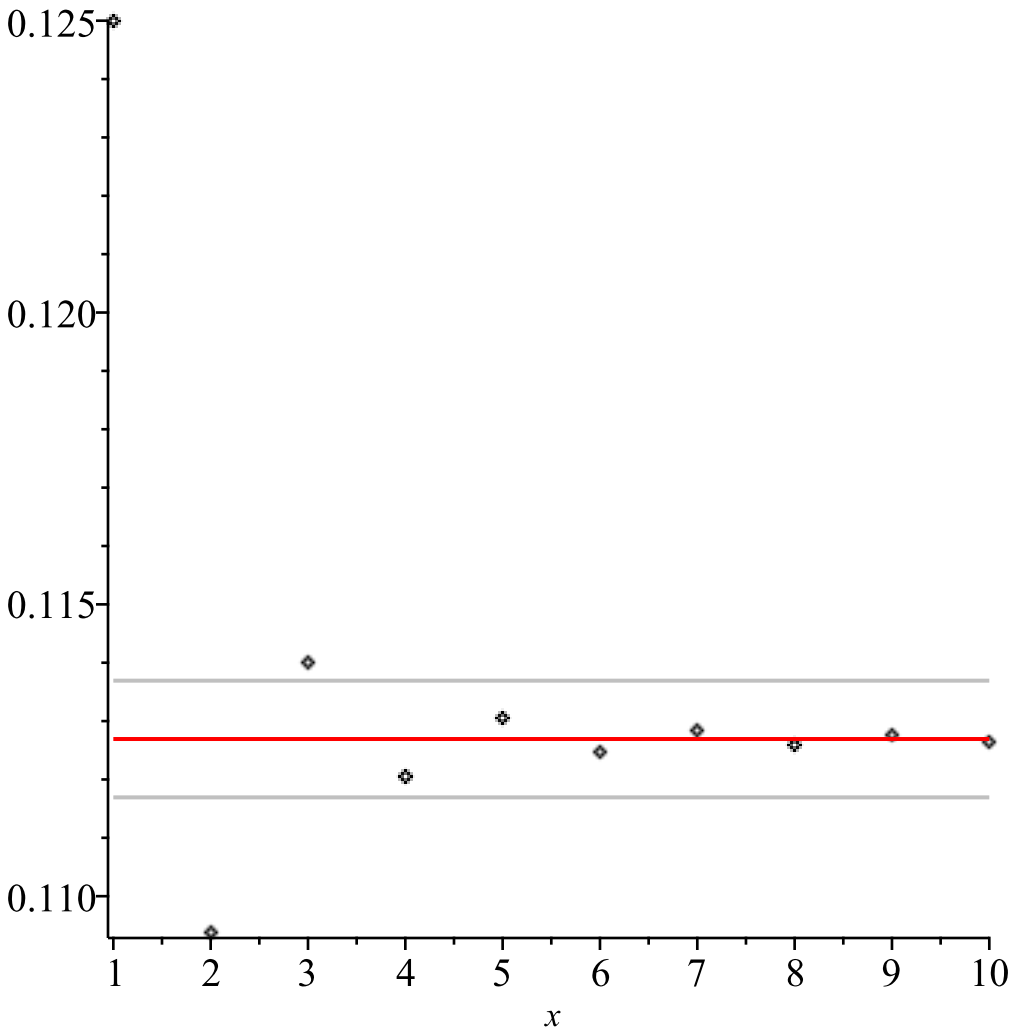
$$\frac{1}{16} \quad \textbf{(13)}$$

$$\text{alpha} := \frac{1}{1000} :$$

$$solve(\{aabs(n+1) = \text{alpha}, n \geq 1\}, n);$$

$$\{n = 4\} \quad \textbf{(14)}$$

$$r := 1..10 :$$
$$p\_s := plots[pointplot](\{seq([i, Sn(i)], i = r)\}) :$$
$$p\_l := plot([S, S - \text{alpha}, S + \text{alpha}], x = r, color = [red, gray, gray]) :$$
$$plots[display](p\_s, p\_l);$$
$$Sn(4) : evalf(\%);$$



$$0.1120515046 \quad \textbf{(15)}$$

#task3

restart :

$$a := n \to \frac{2 \cdot \text{doublefactorial}(n)}{n^n} :$$

$$limit(a(n), n = \text{infinity});$$

$$limit\left(\frac{a(n+1)}{a(n)}, n = \text{infinity}\right);$$

$$0$$

$$0 \quad \textbf{(16)}$$