Вариант 12

a) $\lim\limits_{n\to\infty} \dfrac{1+\frac{1}{3}+...+\frac{1}{3^n}}{1+\frac{1}{5}+...+\frac{1}{5^n}} = \lim\limits_{n\to\infty} \dfrac{\frac{1-\left(\frac{1}{3}\right)^n}{1-\frac{1}{3}}}{\frac{1-\left(\frac{1}{5}\right)^n}{1-\frac{1}{5}}} = \dfrac{4/5}{2/3} = \dfrac{6}{5}$

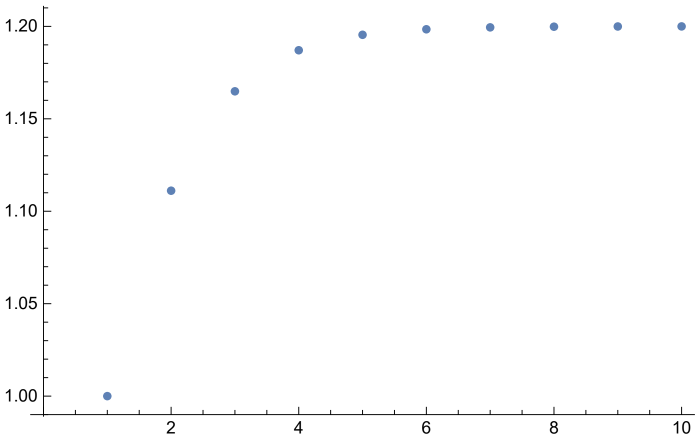
In[5]:= $\texttt{data} = \texttt{Table}\left[\dfrac{\frac{1-\left(\frac{1}{3}\right)^n}{1-\frac{1}{3}}}{\frac{1-\left(\frac{1}{5}\right)^n}{1-\frac{1}{5}}}, \{n, 1, 10\}\right];$

таблица значений

```
ListPlot[data]
```

диаграмма разброса данных

Out[6]=



a) $\lim\limits_{x\to 0} \left(\dfrac{1+\mathrm{tg}\,x}{1+\sin x}\right)^{\frac{1}{\sin^3 x}} = \lim\limits_{x\to 0} e^{\frac{1}{\sin^3 x}\ln\left(\frac{1+\mathrm{tg}\,x}{1+\sin x}\right)} =$

$\lim\limits_{x\to 0} e^{\frac{1}{\sin^3 x}*\ln\left(1+\frac{1+\mathrm{tg}\,x}{1+\sin x}-1\right)} = \lim\limits_{x\to 0} e^{\frac{1}{x^3}*\ln\left(1+\frac{\sin x\,(1-\cos x)}{\cos x\,(1+\sin x)}\right)} = \lim\limits_{x\to 0} e^{\frac{1}{x^3}*\frac{\sin x\,(1-\cos x)}{\cos x\,(1+\sin x)}} = \lim\limits_{x\to 0} e^{\frac{1}{x^3}*\frac{x\,x^2}{2\cos x\,(1+\sin x)}} = e^{1/2}$

In[9]:= $e^{1/2}$ // N

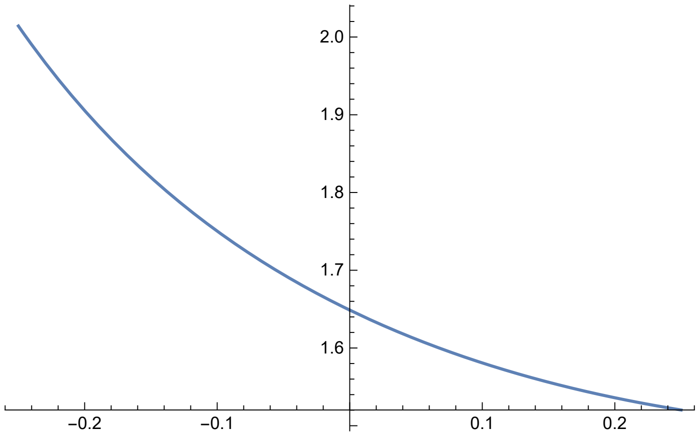
численное приближение

Out[9]= 1.64872

In[8]:= $\text{Plot}\left[\left(\frac{1+\text{Tan}[x]}{1+\text{Sin}[x]}\right)^{\frac{1}{\text{Sin}[x]^3}}, \left\{x, \frac{-1}{4}, \frac{1}{4}\right\}\right]$

график функции

Out[8]=



в) $y = \text{ctg}\,\pi x + \arccos 2^x$

$\sin \pi x \neq 0$ И $|2^x| \leq 1$

$\pi x \neq \frac{\pi}{2} + \pi k,\ k \in Z$ И $x \leq 0$

$x \in \left(\frac{-1}{2};\ 0\right] \cup \left(\bigcup_{k=0}^{\infty}\left(-\frac{1}{2} - k - 1;\ -\frac{1}{2} - k\right)\right)$