Deb n° 1013

Results

Results, calculated by Dr. Dagmar Schönfeld with Mathematica®

a) $f_1(i) = i$; $q(f_1,n) = q$

In[46]:=
$$n = 600\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n} i}{\sqrt[n]{\prod_{i=1}^{n} i}};$$

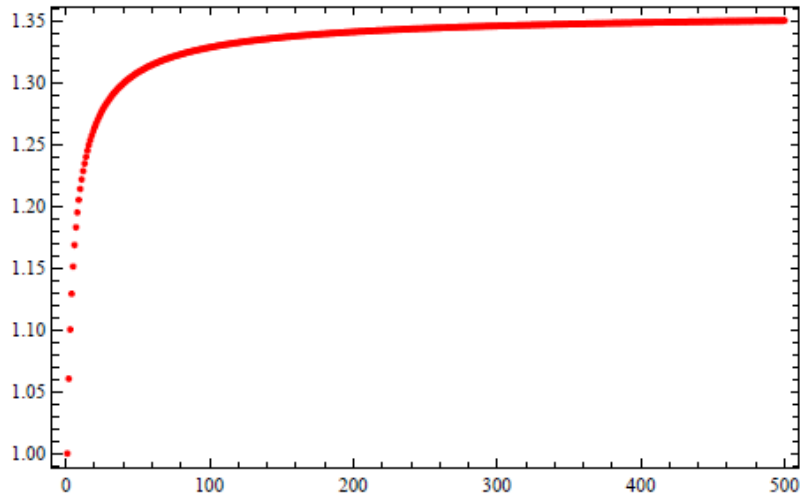
```
Print[N[q, genau], "\nZum Vergleich: e/2=", N[E / 2, genau]];
```

```
1.35912602881405665545933641236
Zum Vergleich: e/2=1.35914091422952261768014373568
```

In[53]:=
$$\text{ListPlot}\left[\text{Table}\left[\frac{\frac{1}{n}\sum_{i=1}^{n} i}{\sqrt[n]{\prod_{i=1}^{n} i}}, \{n, 1, 500\}\right],\right.$$

```
PlotStyle → Red, Frame → True, PlotRange → All]
```

Out[53]=



b) $f_2(i) = 2i-1$; $q(f_2,n) = q$

In[56]:= $n = 600\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n}(2i-1)}{\sqrt[n]{\prod_{i=1}^{n}(2i-1)}};$

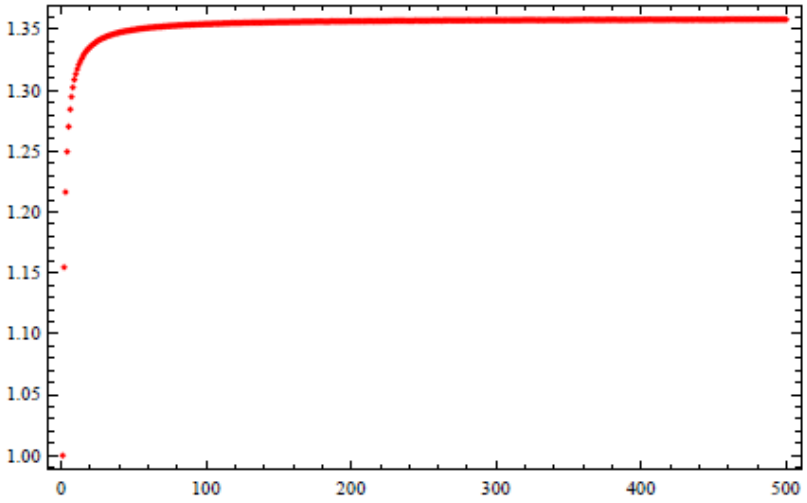
```
Print[N[q, genau], "\nZum Vergleich: e/2=", N[E / 2, genau]];
```

```
1.359140129159329427912240640 05
Zum Vergleich: e/2=1.359140914229522617680143735 68
```

→ schwingt etwas schneller ein !

In[54]:= $\text{ListPlot}\left[\text{Table}\left[\frac{\frac{1}{n}\sum_{i=1}^{n}(2i-1)}{\sqrt[n]{\prod_{i=1}^{n}(2i-1)}}, \{n, 1, 500\}\right],\ \text{PlotStyle} \to \text{Red}, \text{Frame} \to \text{True}, \text{PlotRange} \to \text{All}\right]$

Out[54]=



c) $f_3(i) = fib(i) = Fibonacci[i]$; $q(f_3,n) = q$

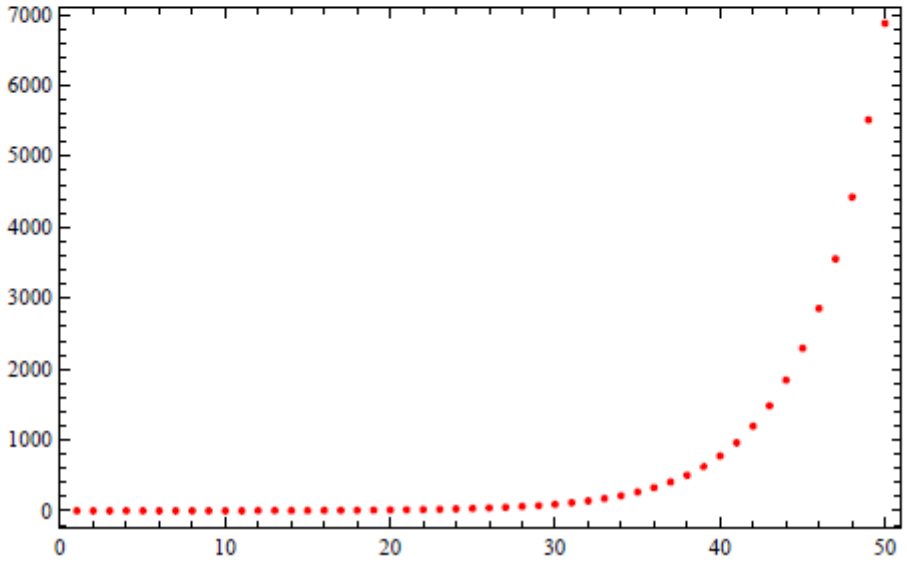
In[67]:=
$$n = 1000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n} Fibonacci[i]}{\sqrt[n]{\prod_{i=1}^{n} Fibonacci[i]}};$$

```
Print[N[q, genau], "\nZum Vergleich: ?"];
```

$6.41523887376818116950730399931 \times 10^{101}$
Zum Vergleich: ?

In[71]:=
$$ListPlot\left[Table\left[\frac{\frac{1}{n}\sum_{i=1}^{n} Fibonacci[i]}{\sqrt[n]{\prod_{i=1}^{n} Fibonacci[i]}}, \{n, 1, 50\}\right],\ PlotStyle \to Red,\ Frame \to True,\ PlotRange \to All\right]$$

Out[71]=



d) $f_4(i) = Prime[i]$; $q(f_4,n) = q$

In[15]:=
$$n = 500\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n} Prime[i]}{\sqrt[n]{\prod_{i=1}^{n} Prime[i]}};$$

```
Print[N[q, genau], "\nZum Vergleich: √2 =", N[√2, genau]];
```

```
1.41839623172399863271757062399
```

$$n = 700\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n} Prime[i]}{\sqrt[n]{\prod_{i=1}^{n} Prime[i]}};$$

```
Print[N[q, genau], "\nZum Vergleich: √2 =", N[√2, genau]];
```

```
1.41658282272272845191718671292
```

$$n = 1\,000\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n} Prime[i]}{\sqrt[n]{\prod_{i=1}^{n} Prime[i]}};$$

```
Print[N[q, genau], "\nZum Vergleich: √2 =", N[√2, genau]];
```

```
1.41476726635475142773070476940
```

In[16]:=
$$t1 = AbsoluteTime[];\ n = 1\,500\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n} Prime[i]}{\sqrt[n]{\prod_{i=1}^{n} Prime[i]}};$$

```
Print[N[q, genau], "\nZum Vergleich: √2 =", N[√2, genau]];
t2 = AbsoluteTime[]; Print["Zeitdauer=", (t2 - t1) / 60., "min"];
```

```
1.41284235582932160625884032677
Zeitdauer=4.7898min
```

In[18]:=
```
t1 = AbsoluteTime[]; n = 3 000 000; genau = 30;
q = (1/n Sum[Prime[i], {i, 1, n}]) / Sqrt[n, Product[Prime[i], {i, 1, n}]]; Print[N[q, genau]];
t2 = AbsoluteTime[]; Print["Zeitdauer=", (t2 - t1) / 60., "min"];
```

```
1.40984504678433271130017133093
```

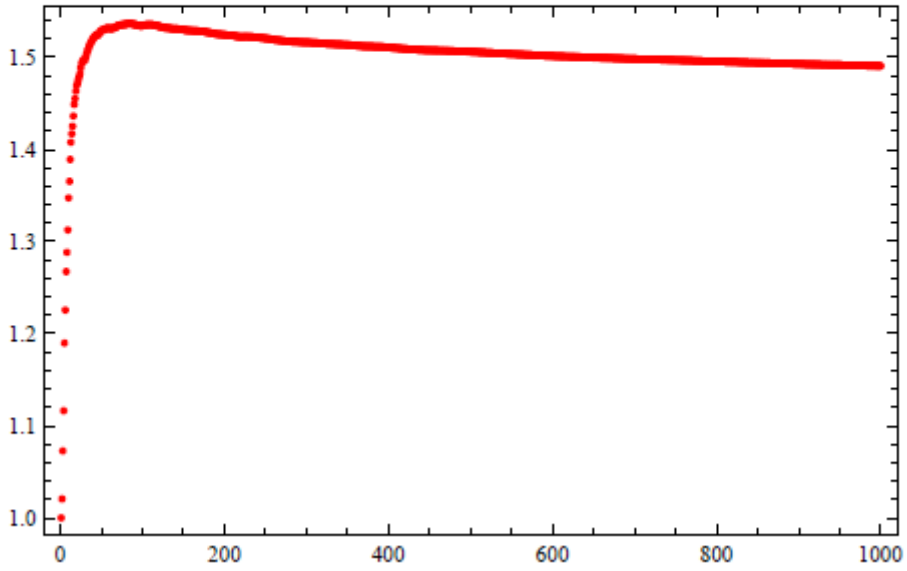
```
Zeitdauer=9.85999min
```

In[65]:=
```
t1 = AbsoluteTime[]; n = 10 000 000; genau = 30;
q = (1/n Sum[Prime[i], {i, 1, n}]) / Sqrt[n, Product[Prime[i], {i, 1, n}]]; Print[N[q, genau]];
t2 = AbsoluteTime[]; Print["Zeitdauer=", (t2 - t1) / 60., "min"];
```

```
1.40537361711246341683417635610
```

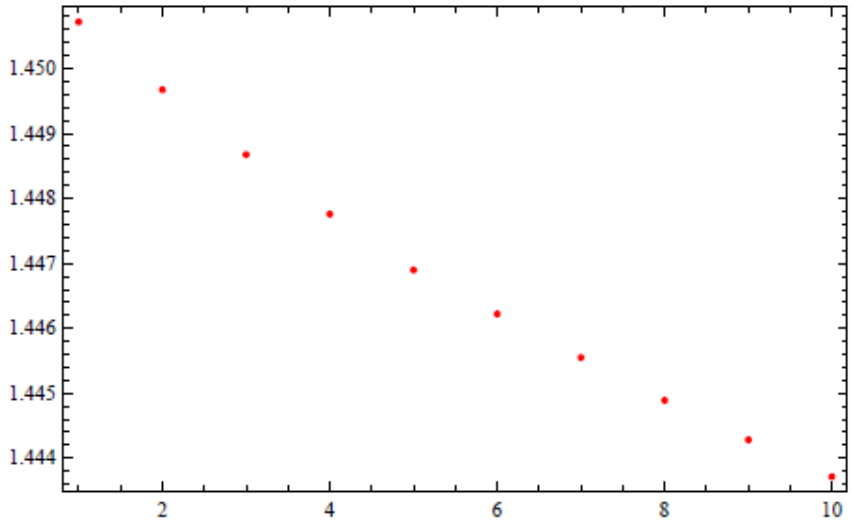
```
Zeitdauer=18.8512min
```

```
ListPlot[Table[(1/n Sum[Prime[i], {i, 1, n}]) / Sqrt[n, Product[Prime[i], {i, 1, n}]], {n, 1, 1000}],
 PlotStyle → Red, Frame → True, PlotRange → All]
```



In[22]:=
$$\text{ListPlot}\left[\text{Table}\left[\frac{\frac{1}{n}\sum_{i=1}^{n}\text{Prime}[i]}{\sqrt[n]{\prod_{i=1}^{n}\text{Prime}[i]}},\ \{n,\ 11\,000,\ 20\,000,\ 1000\}\right],\right.$$
$$\left.\text{PlotStyle} \to \text{Red},\ \text{Frame} \to \text{True},\ \text{PlotRange} \to \text{All}\right]$$

Out[22]=



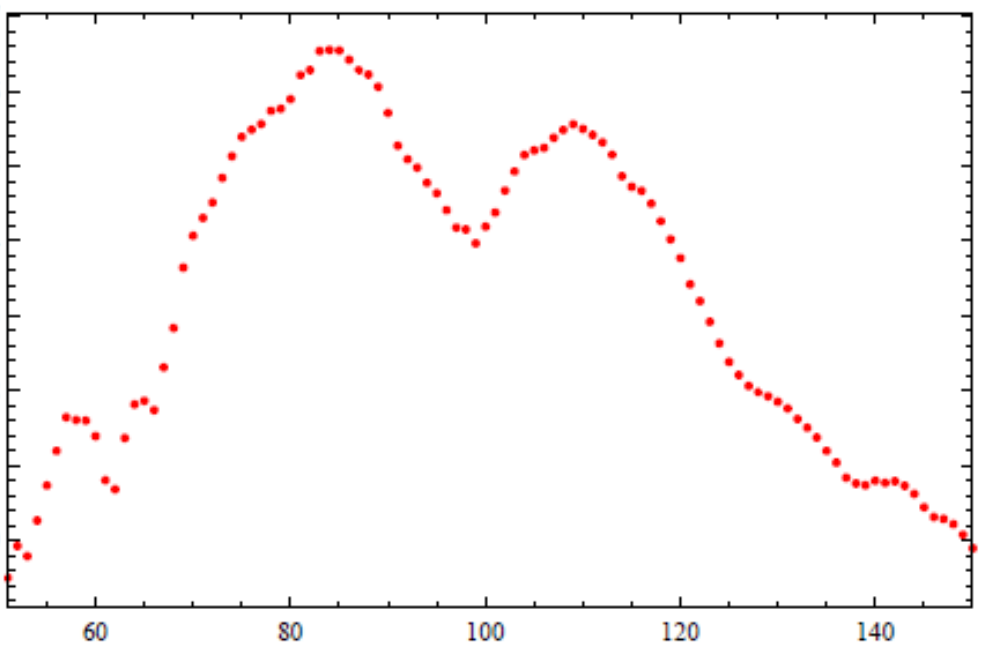
In[63]:=
```
Print[N[werte[[84]], 30]]
```

```
1.536551039003976892473957923 64
```

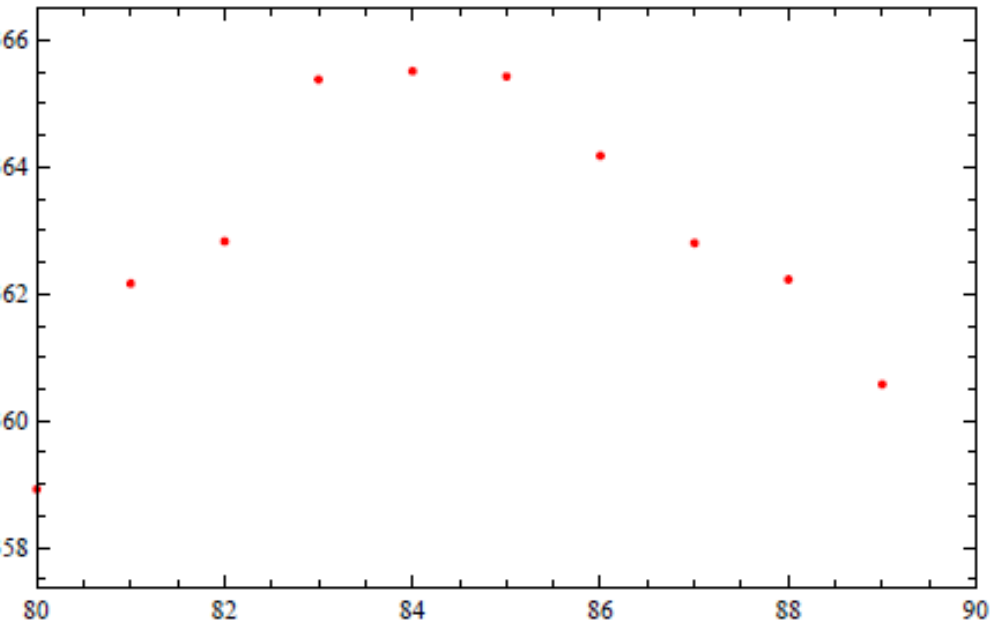
In[87]:=
```
anz = 200; werte = Table[0, {i, anz}];
Table[werte[[n]] = (1/n Sum[Prime[i], {i, 1, n}])/Root[Product[Prime[i], {i, 1, n}], n], {n, 1, anz}];
min = werte[[50]]; max = Max[werte]; Print["max=", N[max, 30]];
ListPlot[werte, PlotStyle → Red, Frame → True,
 PlotRange → {{51, 150}, {min, max + .0005}}]
min = werte[[78]];
ListPlot[werte, PlotStyle → Red,
 Frame → True, PlotRange → {{80, 90}, {min, max + .0001}}]
```

```
max=1.536551039003976892473957923 64
```

Out[88]=



Out[90]=



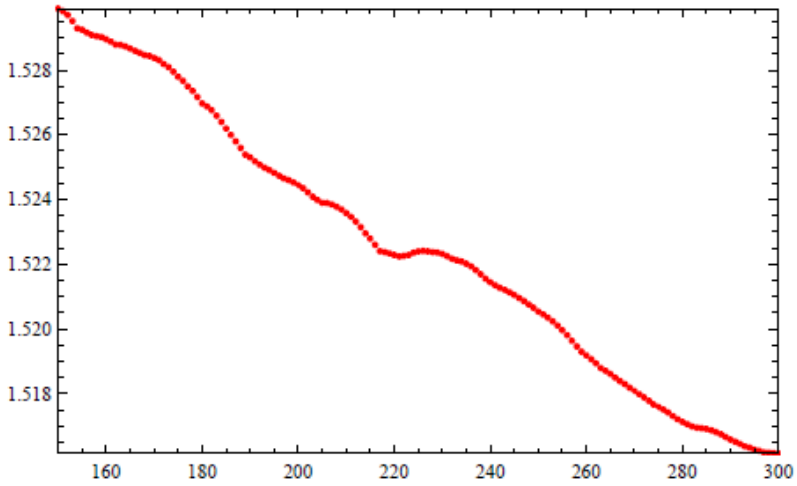
In[163]:=

```
ende = 300; anf = 150; werte = Table[0, {i, ende}];
Table[werte[[n]] = (1/n Sum[Prime[i], {i, 1, n}])/(Product[Prime[i], {i, 1, n}])^(1/n), {n, 1, ende}];
min = werte[[anf]]; Print["min=", N[min, 30]]; max = werte[[anf]];
Table[If[max < werte[[i]], max = werte[[i]]], {i, anf, ende}];
Print["max=", N[max, 30]];
ListPlot[werte, PlotStyle → Red, Frame → True,
 PlotRange → {{anf, ende}, {werte[[anf]], werte[[ende]]}}]
(*min=werte[[anf]];
ListPlot[werte,PlotStyle→Red,Frame→True,PlotRange→{{80,90},{min,max}}]*)
```

```
min=1.52989774156449979498568283120

max=1.52989774156449979498568283120
```

Out[164]=



In[185]:=
```
ende = 600; werte = Table[0, {i, ende}];
```

$$\text{Table}\left[\text{werte}[[n]] = \frac{\frac{1}{n}\sum_{i=1}^{n}\text{Prime}[i]}{\sqrt[n]{\prod_{i=1}^{n}\text{Prime}[i]}}, \{n, 1, \text{ende}\}\right];$$

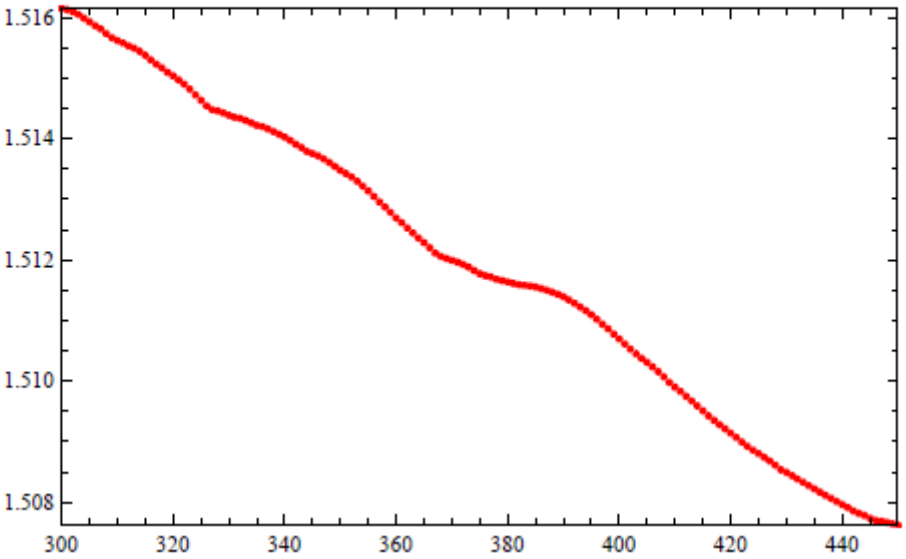
In[185]:=
```
ende = 600; werte = Table[0, {i, ende}];
```

$$\text{Table}\left[\text{werte}[[n]] = \frac{\frac{1}{n}\sum_{i=1}^{n}\text{Prime}[i]}{\sqrt[n]{\prod_{i=1}^{n}\text{Prime}[i]}}, \{n, 1, \text{ende}\}\right];$$

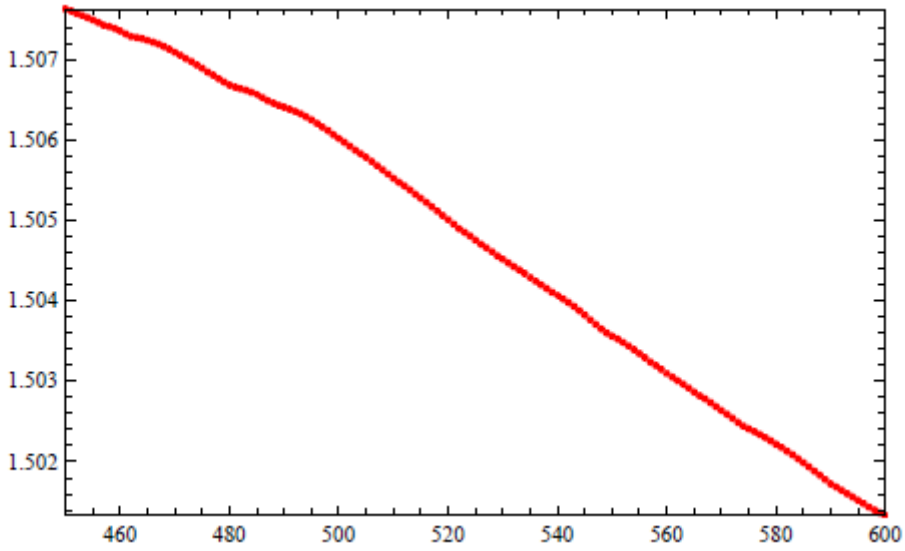
In[186]:=
```
anf = 300; min = werte[[anf]]; Print["min=", N[min, 30]]; max = werte[[anf]];
Table[If[max < werte[[i]], max = werte[[i]]], {i, anf, ende}];
Print["max=", N[max, 30]];
ListPlot[werte, PlotStyle → Red, Frame → True,
 PlotRange → {{anf, 450}, {werte[[anf]], werte[[450]]}}]
ListPlot[werte, PlotStyle → Red, Frame → True,
 PlotRange → {{450, 600}, {werte[[450]], werte[[600]]}}]
(*min=werte[[anf]];
ListPlot[werte,PlotStyle→Red,Frame→True,PlotRange→{{80,90},{min,max}}]*)
```

```
min=1.516153736044542770124143750 87
max=1.516153736044542770124143750 87
```

Out[187]=



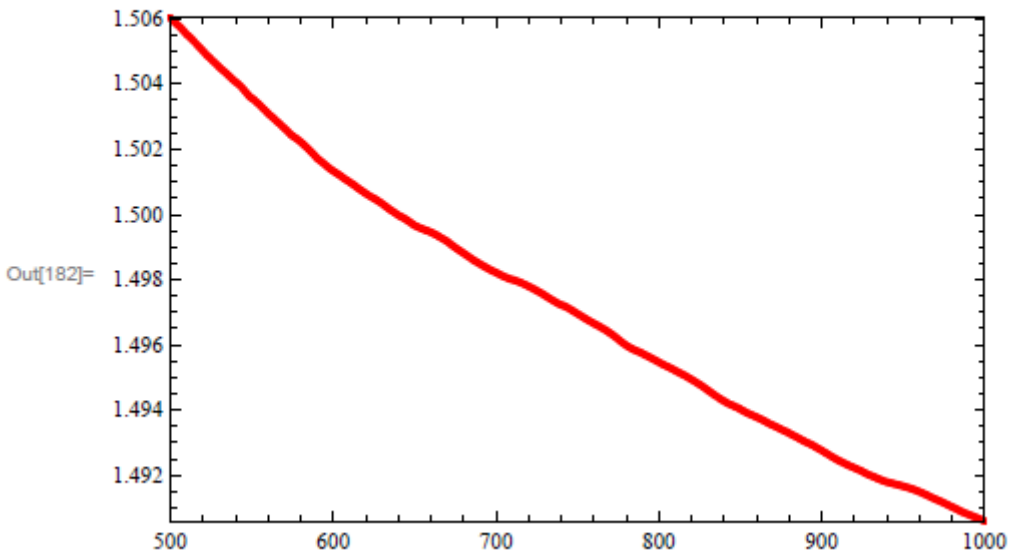
Out[188]=



In[168]:=
```
ende = 1000; werte = Table[0, {i, ende}];
Table[werte[[n]] = (1/n Sum[Prime[i], {i, 1, n}])/(n-th root of Product[Prime[i], {i, 1, n}]), {n, 1, ende}];
```

In[181]:=
```
anf = 500; min = werte[[anf]]; Print["min=", N[min, 30]]; max = werte[[anf]];
Table[If[max < werte[[i]], max = werte[[i]]], {i, anf, ende}];
Print["max=", N[max, 30]];
ListPlot[werte, PlotStyle → Red, Frame → True,
 PlotRange → {{anf, 1000}, {werte[[anf]], werte[[1000]]}}]
(*min=werte[[anf]];
ListPlot[werte,PlotStyle→Red,Frame→True,PlotRange→{{80,90},{min,max}}]*)
```

```
min=1.506016306461685390609344614 50
max=1.506016306461685390609344614 50
```



$q(f_4,n=1000000) =$

1.414767266354751427730704769 40…

Zum Vergleich: Wurzel(2) = 1.414213562373095048801688724 21…

$q(f_4,n=1500000) =$

1.412842355829321606258840326 77…

Schon kleiner Wurzel(2), schade.

$q(f_4,n=3000000) =$

1.409845046784332711300171330 93…

$q(f_4,n=10000000) =$

1.405373617112463416834176356 10…

$q(f_4, n=100000000) =$

1.398731563226203628557876648 21…

In[93]:= $n = 600\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n}(2i+1)}{\sqrt[n]{\prod_{i=1}^{n}(2i+1)}};$

```
Print[N[q, genau], "\nZum Vergleich: e/2=", N[E / 2, genau]];
```

```
1.35911295152980236185648090429
Zum Vergleich: e/2=1.35914091422952261768014373568
```

In[97]:= $n = 1\,000\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n}(2i+1)}{\sqrt[n]{\prod_{i=1}^{n}(2i+1)}};$

```
Print[N[q, genau], "\nZum Vergleich: e/2=", N[E / 2, genau]];
```

```
1.35912344226762385520774926451
Zum Vergleich: e/2=1.35914091422952261768014373568
```

In[97]:= $n = 1\,000\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n}(2i+1)}{\sqrt[n]{\prod_{i=1}^{n}(2i+1)}};$

```
Print[N[q, genau], "\nZum Vergleich: e/2=", N[E / 2, genau]];
```

```
1.35912344226762385520774926451
Zum Vergleich: e/2=1.35914091422952261768014373568
```

In[98]:= $n = 10\,000\,000;\ genau = 30;\ q = \frac{\frac{1}{n}\sum_{i=1}^{n}(2i+1)}{\sqrt[n]{\prod_{i=1}^{n}(2i+1)}};$

```
Print[N[q, genau], "\nZum Vergleich: e/2=", N[E / 2, genau]];
```

```
1.35913885407020365711458462816
Zum Vergleich: e/2=1.35914091422952261768014373568
```

→ schwingt sich scheinbar auch auf e / 2 ein

In[96]:=
$$\text{ListPlot}\left[\text{Table}\left[\frac{\frac{1}{n}\sum_{i=1}^{n}(2i+1)}{\sqrt[n]{\prod_{i=1}^{n}(2i+1)}},\ \{n,\ 1,\ 500\}\right],\right.$$
$$\left.\text{PlotStyle} \to \text{Red},\ \text{Frame} \to \text{True},\ \text{PlotRange} \to \text{All}\right]$$

Out[96]=

