Lösungen

1

```
Remove["Global`*"]

x1 = 2.1898989898989;
x10 = 10 x1;
x1000 = 100 x10;
x990 = x1000 - x10 // Round;
y1 = 19.79;
y100 = 1979.79;
y99 = y100 - y1 // Round;
z1 = 18.97;
z100 = 1897.97;
z99 = z100 - z1 // Round;

x = x990 / 990
```

$$\frac{1084}{495}$$

```
N[%, 20]
```

```
2.1898989898989898990
```

```
y = y99 / 99
```

$$\frac{1960}{99}$$

```
N[%, 20]
```

```
19.797979797979797980
```

```
z = z99 / 99
```

$$\frac{1879}{99}$$

```
N[%, 20]
```

```
18.979797979797979798
```

```
x / (y - z)
```

$$\frac{1084}{405}$$

```
N[%, 20]
```

```
2.6765432098765432099
```

Kontrolle:

```
x1 / (y1 - z1)
```

```
2.67061
```

```
(2168 / 990) / (81736 / 99900) // N
```

```
2.67656
```

2

```
Remove["Global`*"]
```

```
g1 = (4 y - 2 z + w == 14);
g2 = (y + 2 z + w == 56);
g3 = (3 y - 4 z == 40);
Solve[{g1, g2, g3}, {y, z, w}]
```

```
{}
```

3

```
Remove["Global`*"]
```

```
x = Log[Sqrt[(E^(3 (Log[E^2] + Log[E^6]))) / E^Log[3]]]
```

$$\text{Log}\left[\frac{e^{12}}{\sqrt{3}}\right]$$

```
x // Simplify
```

$$12 - \frac{\text{Log}[3]}{2}$$

```
N[%, 20]
```

```
11.450693855665945154
```

```
x // N
```

```
11.4507
```

4

```
Remove["Global`*"]
```

```
x = ((E^(1 / 2 Log[2] + Log[32]))^(1 / 3)) ((E^(1 / 3))^2)^Log[8]
```

$$8\ 2^{5/6}$$

```
x // Simplify
```

$$8\ 2^{5/6}$$

```
N[%, 20]
```

```
14.254379490245428876
```

```
x // N
```

```
14.2544
```

5

```
Remove["Global`*"]
```

```
A = Log[a^(1 / 4)] - 1 / 2 Log[1 / (b - Sqrt[b^2 - a^2])] +
    1 / 2 Log[b / a + Sqrt[(b^2) / (a^2) - 1]] // Simplify
```

$$\frac{1}{4}\left(\text{Log}[a]-2\,\text{Log}\left[\frac{1}{b-\sqrt{-a^2+b^2}}\right]+2\,\text{Log}\left[\frac{b}{a}+\sqrt{-1+\frac{b^2}{a^2}}\right]\right)$$

```
b^2 ≥ a^2
```

$b^2 \geq a^2$

Bedingungen:
1) $a > 0$
2) $b^2 > a^2$
3) $\frac{b}{a} > 0$, also $b > 0$

Somit $0 < a < b$

6

```
Remove["Global`*"]
```

```
γ = 32 Degree // N
```

```
0.558505
```

```
a = 5.886;
b = 2.159;
c^2 == a^2 + b^2 - 2 a b Cos[γ] // Solve
```

```
{{c → -4.21337}, {c → 4.21337}}
```

```
c = 4.213371606707448`;
a / Sinα == c / Sin[γ] // Solve
```

```
{{Sinα → 0.740287}}
```

```
Sinα = 0.7402871335419849`; α = ArcSin[Sinα]
```

```
0.833497
```

```
α = Pi - α
```

```
2.3081
```

```
α / Degree
```

```
132.244
```

```
b / Sinβ == c / Sin[γ] // Solve
```

```
{{Sinβ → 0.271539}}
```

```
Sinβ = 0.2715392322998888`; β = ArcSin[Sinβ]
```

```
0.274992
```

```
β / Degree
```

```
15.7559
```

Kontrolle

```
(α + β + γ) / Degree
```

```
180.
```

7

```
Remove["Global`*"]
```

```
u = (1 / a^3 - 1 / b^3) / (1 / a^2 + 1 / (a b) + 1 / b^2)
```

$$\frac{\frac{1}{a^3}-\frac{1}{b^3}}{\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{a\,b}}$$

```
u // Simplify
```

$$\frac{1}{a}-\frac{1}{b}$$

```
res = ((u 4^(4 (x + 1)) 6^(-3 x) 4^(-4) == 3^(2 - x))) // Simplify
```

$$\frac{\left(\frac{32}{27}\right)^{x}\,(-a+b)}{a\,b}==3^{2-x}$$

```
res // Solve
```

$$\left\{\left\{x\to -\frac{\text{Log}\left[\frac{1}{9}\left(\frac{1}{a}-\frac{1}{b}\right)\right]}{-2\,\text{Log}[3]+\text{Log}[32]}\right\}\right\}$$

Lösung : $\left\{\left\{x\to -\frac{\text{Log}\left[\frac{1}{9}\left(\frac{1}{a}-\frac{1}{b}\right)\right]}{-2\,\text{Log}[3]+\text{Log}[32]}\right\}\right\}$

Damit noch etwas herumprobieren :

```
N[%, 20]
```

$$\left\{\left\{x \to -0.78832563803449324268\right.\right.$$
$$\left.\left.\text{Log}\left[0.11111111111111111111\left(\frac{1}{a} - \frac{1.0000000000000000000}{b}\right)\right]\right\}\right\}$$

```
-Log[1 / 9] / (-2 Log[3] + Log[32]) // N
```

```
1.73213
```

```
-(Log[1/9 (1/a - 1/b)] / (-2 Log[3] + Log[32])) + (-Log[9] + Log[1 / a - 1 / b]) / (-2 Log[3] + Log[32]) // Simplify
```

```
0
```

8

```
Remove["Global`*"]
```

```
g1 = (u == (x + y) / Sqrt[2]); g2 = (v == (x - y) / Sqrt[2]);
solv = Solve[{g1, g2}, {x, y}] // Flatten
```

$$\left\{x \to \frac{u}{\sqrt{2}} + \frac{v}{\sqrt{2}},\ y \to \frac{u}{\sqrt{2}} - \frac{v}{\sqrt{2}}\right\}$$

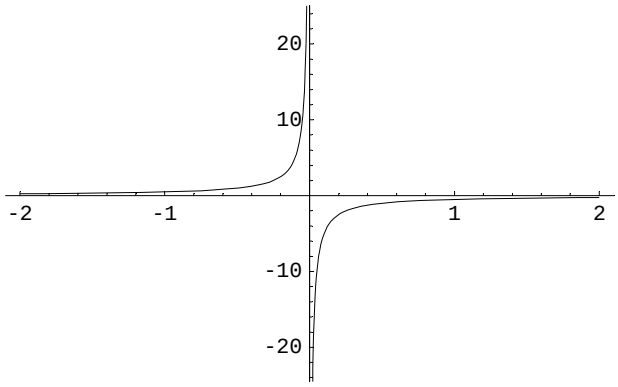
```
(g3 = (y^2 - x^2 == 1) /. solv) // FullSimplify
```

$$-2\,u\,v == 1$$

```
Solve[-2 u v == 1, {v}]
```

$$\left\{\left\{v \to -\frac{1}{2\,u}\right\}\right\}$$

```
v[u_] := -1/(2 u); Plot[v[u], {u, -2, 2}];
```



Hyperbel

9

```
Remove["Global`*"]
```

```
res = (x - 3 y) (2 b + 2 / 3 a) / ((1 / 9 a^2 + b^2 + 2 / 3 a b) (x^3 - 27 y^3))
```

$$\frac{\left(\frac{2\,a}{3}+2\,b\right)\,(x-3\,y)}{\left(\frac{a^2}{9}+\frac{2\,a\,b}{3}+b^2\right)\,(x^3-27\,y^3)}$$

```
res // Simplify
```

$$\frac{6}{(a+3\,b)\,(x^2+3\,x\,y+9\,y^2)}$$

10

```
Remove["Global`*"]
```

```
α = ArcSin[Tan[1] / 10 Cos[Sin[Cos[1]]]] // N
```

```
0.136005
```

```
β = ArcCos[Cot[1] Sin[Cos[Sin[1]]]] // N
```

```
1.16266
```

alpha kleiner als beta.