

```

[ > ifactor(11654175725725);
      (5)2 (13) (19) (1887315907)
[ > nextprime(10000);
      10007
[ > prevprime(10000);
      9973
[ > ithprime(1000);
      7919
[ > floor(4.7);
      4
[ > ceil(4.7);
      5
[ > round(4.5);
      5
[ > frac(4.7);
      .7
[ > gcd(234, 24);
      6
[ > lcm(24, 18);
      72
[ > lcm(x2-1, x3-1);
      (x+1)(x3-1)
[ > gcd(x2-1, x3-1);
      x-1
[ > phi(12);
      φ(12)
[ > with(numtheory);

```

Warning, the protected name order has been redefined and unprotected

[*GIgcd, bigomega, cfrac, cfracpol, cyclotomic, divisors, factorEQ, factorset, fermat, imagunit, index, integral\_basis, invcfrac, invphi, issqrfree, jacob, kronecker, λ, legendre, mcombine, mersenne, minkowski, mipolys, mlog, mobius, mroot, msqrt, nearestp, nthconver, nthdenom, nthnumer, nthpow, order, pdexpand, φ, π, pprimroot, primroot, quadres, rootsunity, safeprime, σ, sq2factor, sum2sqr, τ, thue*]

> phi(12);

4

> cfrac(Pi);

$$3 + \frac{1}{7 + \frac{1}{15 + \frac{1}{1 + \frac{1}{292 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2 + \frac{1}{1 + \frac{1}{3 + \dots}}}}}}}}}}}}}}}}$$

> add(n, n=1..100);

```
>
```

5050

```
> sum(k,k=1..n);
```

$$\frac{1}{2}(n+1)^2 - \frac{1}{2}n - \frac{1}{2}$$

```
> Sum(k,k=1..n);
```

$$\sum_{k=1}^n k$$

```
> k:=4;
```

k:=4

```
> k*k;
```

16

```
> sum(k,k=1..n);
```

Error, (in sum) summation variable previously assigned, second argument evaluates to 4 = 1 .. n

```
> sum('k','k'=1..n);
```

$$\frac{1}{2}(n+1)^2 - \frac{1}{2}n - \frac{1}{2}$$

```
> k;
```

4

```
> k:='k';
```

k:=k

```
> k;
```

k

```
> restart;
```

```
> mul(k,k=1..4);
```

```

|
|                                     24
| > product(1+1/k,k=1..n);
|                                      $\frac{\Gamma(n+2)}{\Gamma(n+1)}$ 
| > simplify(%);
|                                     n+1
| > Product(1+1/k,k=1..n);
|                                      $\prod_{k=1}^n \left(1 + \frac{1}{k}\right)$ 
| > add(product(1+1/k,k=1..n),n=1..5);
|                                     20
| > p:=n->product(sqrt(k),k=1..n);
|                                      $p := n \rightarrow \prod_{k=1}^n \sqrt{k}$ 
| > p(4);
|                                      $\sqrt{2} \sqrt{3} \sqrt{4}$ 
| > simplify(%);
|                                      $2\sqrt{2} \sqrt{3}$ 
| > sum(1/k^2,k=1..infinity);
|                                      $\frac{1}{6} \pi^2$ 
| > limit(sin(x)/x,x=0);
|                                     1
| > limit(sin(x)/x,x=infinity);
|                                     0
|

```

```
> limit(1/x,x=0);
```

*undefined*

```
> limit(1/x,x=0,left);
```

$-\infty$

```
> binomial(n,k);
```

$\text{binomial}(n, k)$

```
> binomial(4,2);
```

6

```
> 3!;
```

6

```
> R:=(a+x+x^4)/(a*x+x^3)+2/x;
```

$$R := \frac{a+x+x^4}{ax+x^3} + \frac{2}{x}$$

```
> normal(R);
```

$$\frac{3a+x+x^4+2x^2}{x(a+x^2)}$$

```
> convert(R,parfrac,x);
```

$$x + \frac{3}{x} - \frac{-1+x+ax}{a+x^2}$$

```
> numer(R);
```

$$3a+x+x^4+2x^2$$

```
> denom(R);
```

$$x(a+x^2)$$

```
> f:=(tan(x)+exp(I*x)*cos(y)+cot(y))/(1+exp(I*x*y));
```

$$f := \frac{\tan(x) + e^{(Ix)} \cos(y) + \cot(y)}{1 + e^{(Iy)}}$$

> convert(f, trig, x);

$$\frac{\tan(x) + (\cos(x) + I \sin(x)) \cos(y) + \cot(y)}{1 + \cos(y) + I \sin(y)}$$

> convert(f, exp);

$$\frac{-\frac{I((e^{(Ix)})^2 - 1)}{(e^{(Ix)})^2 + 1} + e^{(Ix)} \left( \frac{1}{2} e^{(Iy)} + \frac{1}{2} \right) + \frac{I((e^{(Iy)})^2 + 1)}{(e^{(Iy)})^2 - 1}}{1 + e^{(Iy)}}$$

> convert(f, sincos);

$$\frac{\frac{\sin(x)}{\cos(x)} + e^{(Ix)} \cos(y) + \frac{\cos(y)}{\sin(y)}}{1 + e^{(Iy)}}$$

> pqformel := solve(x^2+p\*x+q=0, x);

$$pqformel := -\frac{1}{2}p + \frac{1}{2}\sqrt{p^2 - 4q}, -\frac{1}{2}p - \frac{1}{2}\sqrt{p^2 - 4q}$$

> pqformel[2];

$$-\frac{1}{2}p - \frac{1}{2}\sqrt{p^2 - 4q}$$

> p := x^3 - 4\*x + 1;

$$p := x^3 - 4x + 1$$

> np := solve(p, x);

>

$$\begin{aligned}
np := & \frac{1}{6} (-108 + 12 I \sqrt{687})^{(1/3)} + \frac{8}{(-108 + 12 I \sqrt{687})^{(1/3)}}, \\
& - \frac{1}{12} (-108 + 12 I \sqrt{687})^{(1/3)} - \frac{4}{(-108 + 12 I \sqrt{687})^{(1/3)}} \\
& + \frac{1}{2} I \sqrt{3} \left( \frac{1}{6} (-108 + 12 I \sqrt{687})^{(1/3)} - \frac{8}{(-108 + 12 I \sqrt{687})^{(1/3)}} \right) \\
& - \frac{1}{12} (-108 + 12 I \sqrt{687})^{(1/3)} - \frac{4}{(-108 + 12 I \sqrt{687})^{(1/3)}} \\
& - \frac{1}{2} I \sqrt{3} \left( \frac{1}{6} (-108 + 12 I \sqrt{687})^{(1/3)} - \frac{8}{(-108 + 12 I \sqrt{687})^{(1/3)}} \right)
\end{aligned}$$

> np[1];

$$\frac{1}{6} (-108 + 12 I \sqrt{687})^{(1/3)} + \frac{8}{(-108 + 12 I \sqrt{687})^{(1/3)}}$$

> evalf(np[1]);

$$1.860805853 - .3 \cdot 10^{-9} I$$

> evalf(np[1], 30);

$$1.86080585311170338638583618087 - .3 \cdot 10^{-29} I$$

> evalc(np[1]);

$$\begin{aligned}
& \frac{1}{6} 192^{(1/3)} 3^{(1/6)} \cos\left(-\frac{1}{3} \arctan\left(\frac{1}{9} \sqrt{687}\right) + \frac{1}{3} \pi\right) \\
& + \frac{1}{72} 192^{(2/3)} 3^{(5/6)} \cos\left(-\frac{1}{3} \arctan\left(\frac{1}{9} \sqrt{687}\right) + \frac{1}{3} \pi\right) + I \left(
\end{aligned}$$

$$\frac{1}{6} 192^{(1/3)} 3^{(1/6)} \sin\left(-\frac{1}{3} \arctan\left(\frac{1}{9} \sqrt{687}\right) + \frac{1}{3} \pi\right) - \frac{1}{72} 192^{(2/3)} 3^{(5/6)} \sin\left(-\frac{1}{3} \arctan\left(\frac{1}{9} \sqrt{687}\right) + \frac{1}{3} \pi\right)$$

> simplify(%);

$$\frac{4}{3} \sqrt{3} \cos\left(-\frac{1}{3} \arctan\left(\frac{1}{9} \sqrt{3} \sqrt{229}\right) + \frac{1}{3} \pi\right)$$

> evalf(np[2]);

$$-2.114907540 + .2866025404 10^{-9} I$$

>