```
> # Aufgabe 5.1
> restart;
> b := (11-(2*sqrt(2)-sqrt(3))^2)/sqrt(48);
```

$$b := \frac{\left(11 - \left(2\sqrt{2} - \sqrt{3}\right)^2\right)\sqrt{3}}{12} \tag{1}$$

```
> simplify(b);
```

$$\sqrt{2} \tag{2}$$

```
> c := abs(Pi^exp(1) - exp(Pi));
```

$$c := -\pi^{e} + e^{\pi} \tag{3}$$

```
> evalf[25](c);
```

$$0.681534914418223532301 95 \tag{4}$$

```
> z := (1+I)/((2+I)*(4+I));
```

$$z := \frac{13}{85} + \frac{I}{85} \tag{5}$$

```
> Re(z);
```

$$\frac{13}{85} \tag{6}$$

```
> Im(z);
```

$$\frac{1}{85} \tag{7}$$

```
> abs(z);
```

$$\frac{\sqrt{170}}{85} \tag{8}$$

```
> s := sum(1/k, k=1..100);
```

$$s := \frac{14466636279520351160221518043104131447711}{2788815009188499086581352357412492142272} \tag{9}$$

```
> evalf(s);
```

$$5.187377518 \tag{10}$$

```
> # Aufgabe 5.2
> restart;
> f := (1/x - x^3)/((1+x)*(1/x+x));
```

$$f := \frac{\frac{1}{x} - x^3}{(1+x)\left(\frac{1}{x} + x\right)} \tag{11}$$

```
> simplify(f);
```

$$-x + 1 \tag{12}$$

```
> p := x^4+5*x^3-7*x^2-29*x+30;
```

$$p := x^4 + 5x^3 - 7x^2 - 29x + 30 \tag{13}$$

```
> factor(p);
```

$$(x-1)(x-2)(x+5)(x+3) \tag{14}$$

```
> g := x*(a-x)^2 + x^2*(3*a-x);
```

$$g := x(a-x)^2 + x^2(3a-x) \tag{15}$$

```
> ge := expand(g);
```

$$ge := a^2 x + x^2 a \tag{16}$$

```
> eval(ge, [a=2, x=1/2]);
```

$$\frac{5}{2} \tag{17}$$

```
> eval(g, [a=2, x=1/2]);
```

$$\frac{5}{2} \tag{18}$$

```
> pk := binomial(S,k)*binomial(N-S,n-k)/binomial(N,n);
```

$$pk := \frac{\binom{S}{k}\binom{N-S}{n-k}}{\binom{N}{n}} \tag{19}$$

```
> mu := sum(k*pk,k=0..n);
```

$$\mu := \frac{S\,n}{N} \tag{20}$$

```
> v := sum((k-mu)^2*pk,k=0..n);
```

$$v := \frac{S\,(N-S)\,n\,(N-n)}{N^2\,(N-1)} \tag{21}$$

```
> # Aufgabe 5.3
> restart;
> S := solve(z^9+z=0, z);
```

$$S := 0, \frac{\sqrt{2+\sqrt{2}}}{2} + \frac{I\sqrt{2-\sqrt{2}}}{2}, \frac{\sqrt{2-\sqrt{2}}}{2} + \frac{I\sqrt{2+\sqrt{2}}}{2}, -\frac{\sqrt{2-\sqrt{2}}}{2} + \frac{I\sqrt{2+\sqrt{2}}}{2}, -\frac{\sqrt{2+\sqrt{2}}}{2} + \frac{I\sqrt{2-\sqrt{2}}}{2}, -\frac{\sqrt{2+\sqrt{2}}}{2} - \frac{I\sqrt{2-\sqrt{2}}}{2}, -\frac{\sqrt{2-\sqrt{2}}}{2} - \frac{I\sqrt{2+\sqrt{2}}}{2}, \frac{\sqrt{2-\sqrt{2}}}{2} - \frac{I\sqrt{2+\sqrt{2}}}{2}, \frac{\sqrt{2+\sqrt{2}}}{2} - \frac{I\sqrt{2-\sqrt{2}}}{2} \tag{22}$$

```
> evalf(S);
```

$$0., 0.9238795325 + 0.3826834325\,I, 0.3826834325 + 0.9238795325\,I, -0.3826834325 + 0.9238795325\,I, -0.9238795325 + 0.3826834325\,I, -0.9238795325 - 0.3826834325\,I, -0.3826834325 - 0.9238795325\,I, 0.3826834325 - 0.9238795325\,I, 0.9238795325 - 0.3826834325\,I \tag{23}$$

```
> Sn := sum(k^2, k=1..n);
```

$$Sn := \frac{(n+1)^3}{3} - \frac{(n+1)^2}{2} + \frac{n}{6} + \frac{1}{6} \tag{24}$$

```
> Sn := simplify(Sn);
```

$$Sn := \frac{1}{3}n^3 + \frac{1}{2}n^2 + \frac{1}{6}n \tag{25}$$

```
> solve(Sn = 2745429470, n);
```

$$2019, -\frac{4041}{4} - \frac{I\sqrt{48940559}}{4}, -\frac{4041}{4} + \frac{I\sqrt{48940559}}{4} \quad (26)$$

```
> # das gesuchte n ist 2019
```

```
> restart;
> gl1 := (1/10)*p + (4/10)*r = (15/100)*2;    # Gleichung fuer Alkoholmenge
```

$$gl1 := \frac{p}{10} + \frac{2\,r}{5} = \frac{3}{10} \quad (27)$$

```
> gl2 := p + r = 2;   # Gleichung fuer Fluessigkeitsmenge
```

$$gl2 := p + r = 2 \quad (28)$$

```
> solve({gl1, gl2}, {p, r});
```

$$\left\{p = \frac{5}{3}, r = \frac{1}{3}\right\} \quad (29)$$

```
> # Man braucht 1/3 Liter Rum und 5/3 Liter Prosecco
```