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> # Praktikum "Mathematik am Computer" (HS18) / Prof. H.Harbrecht, R.
> Brügger, S. Bruggmann, R. Dohrau
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```
> # Maple-Beilageblätter zur Serie 4 (zur 42.
> KW)
```

```
> # Teil 1 : Rechnen mit Zahlen
```

```
> restart;
```

```
> 1 + 2;
```

3

(1)

```
> 12 · 34567890 ;
```

414814680

(2)

```
> 13439;
```

```
905914344031473705525163856620677712914023509111870374238564740740974232090\
59057664
```

(3)

```
>  $\frac{3}{5} + \frac{5}{9} + \frac{7}{12}$ ;
```

$\frac{313}{180}$

(4)

```
> sqrt(12);
```

$2\sqrt{3}$

(5)

```
> 2 · (Pi + 3);
```

$2\pi + 6$

(6)

```
>  $\sin\left(\frac{5 \cdot \text{Pi}}{3}\right)$ ;
```

$-\frac{\sqrt{3}}{2}$

(7)

```
> exp(2);
```

e^2

(8)

```
> abs(exp(1) - 2 - Pi);
```

$-e + 2 + \pi$

(9)

```
> k :=  $\frac{3}{5} + \frac{5}{9} + \frac{7}{12}$ ;
```

$k := \frac{313}{180}$

(10)

```
> evalf(k);
```

1.738888889

(11)

```
> sqrt(k);
```

(12)

$$\frac{\sqrt{1565}}{30} \quad (12)$$

> evalf(%, 30);

$$1.31866936299016551046116636430 \quad (13)$$

> $4 - \frac{1}{3}$;

$$\frac{11}{3} \quad (14)$$

> $4.0 - \frac{1}{3}$;

$$3.666666667 \quad (15)$$

> evalf(%%, 20);

$$3.6666666666666666667 \quad (16)$$

> $w := x^2 - 4 \cdot x + 7$;

$$w := x^2 - 4x + 7 \quad (17)$$

> $x := 65$;

$$x := 65 \quad (18)$$

> w ;

$$3972 \quad (19)$$

> $x := 345$;

$$x := 345 \quad (20)$$

> w ;

$$117652 \quad (21)$$

> $x := 'x'$;

$$x := x \quad (22)$$

> w ;

$$x^2 - 4x + 7 \quad (23)$$

```

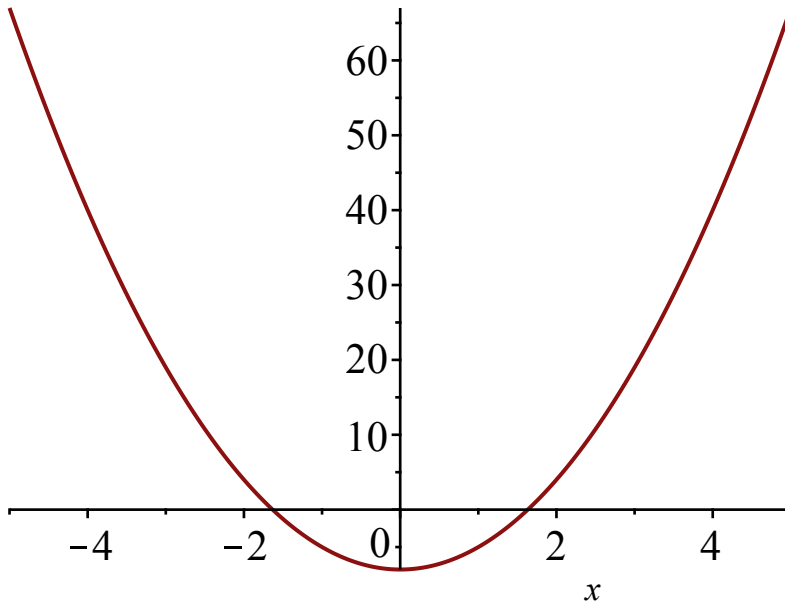
> # Teil 2 : Algebraische Manipulationen
> restart;
> w := 3 · x2 + 8;
w := 3 x2 + 8 (24)
> subs(x = 4, w);
56 (25)
> x;
x (26)
> z := subs(x = 7 + 2 · u, w);
z := 3 (7 + 2 u)2 + 8 (27)
> expand(z);
12 u2 + 84 u + 155 (28)
> subs(u = 5/7, %);
10835/49 (29)
> evalf(%, 30);
221.122448979591836734693877551 (30)
> w := 3 · x2 - 10 · x - 8;
w := 3 x2 - 10 x - 8 (31)
> factor(w);
(3 x + 2) (x - 4) (32)
> factor(x2 · y + 2 · x · y + y);
y (x + 1)2 (33)
> a := (x2 - 3 · x + 2) / (x - 2);
a := (x2 - 3 x + 2) / (x - 2) (34)
> simplify(a);
x - 1 (35)
> b := 1 / (x + 1) + x / (x - 1);
b := 1 / (x + 1) + x / (x - 1) (36)
> simplify(b);
(x2 + 2 x - 1) / (x2 - 1) (37)

```

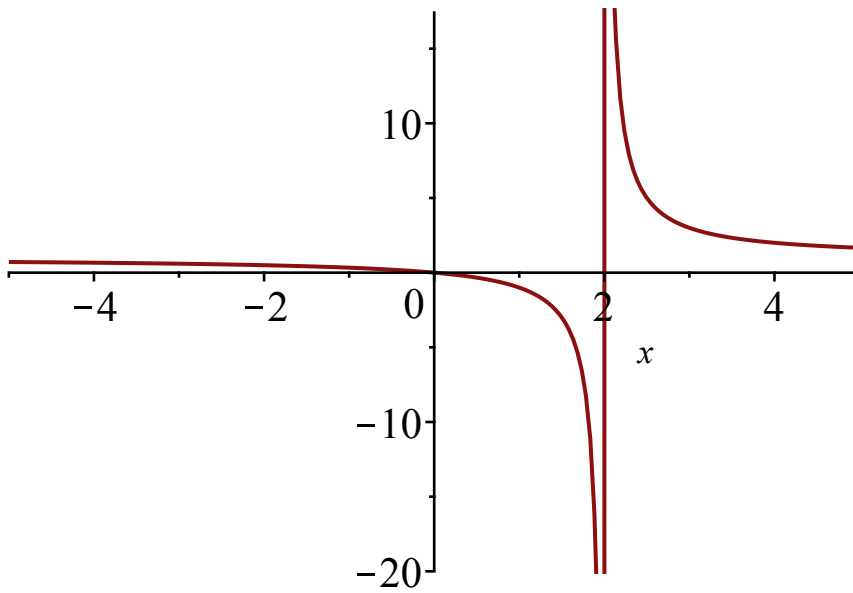
```
> # Teil 3 : Graphische Darstellung
```

```
> restart;
```

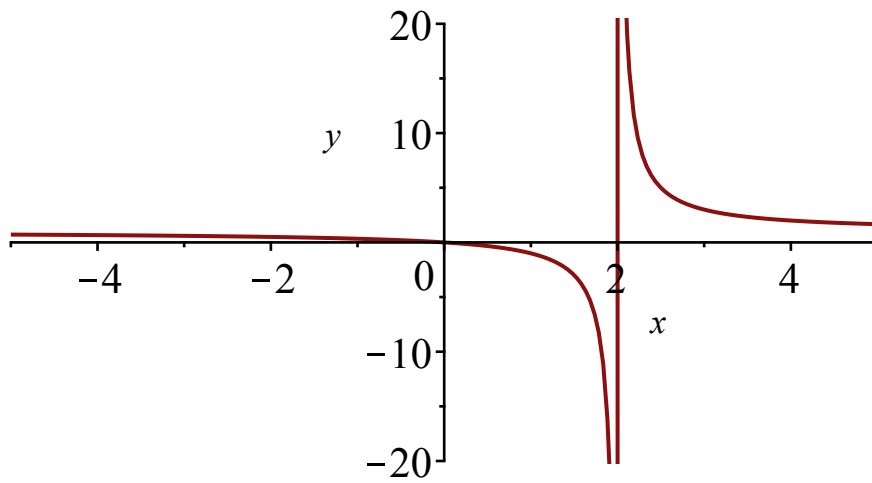
```
> plot(3 · x2 - 8, x = -5 .. 5);
```



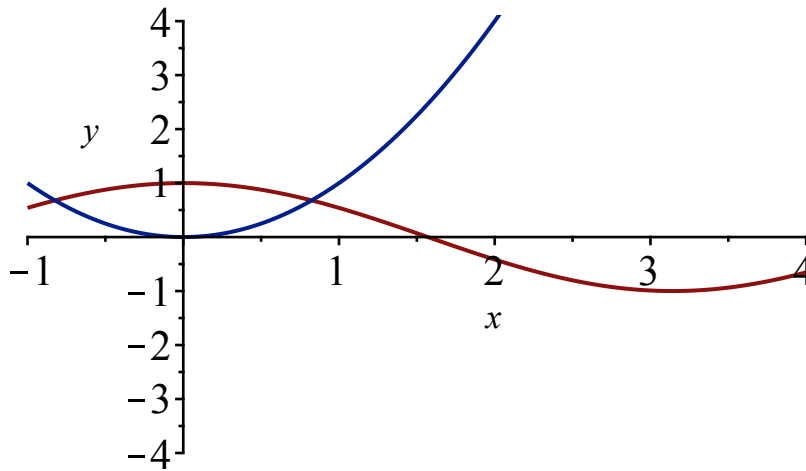
```
> plot( $\frac{x}{x-2}$ , x = -5 .. 5);
```



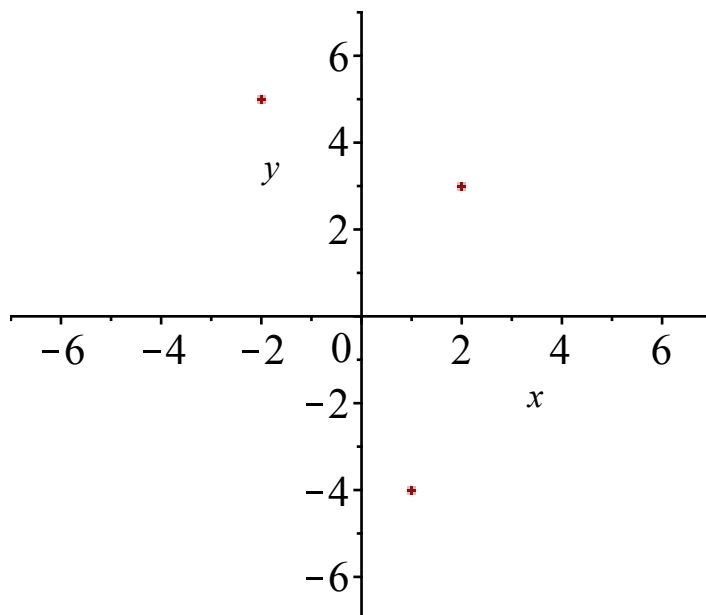
```
> plot( $\frac{x}{x-2}$ , x = -5 .. 5, y = -20 .. 20);
```



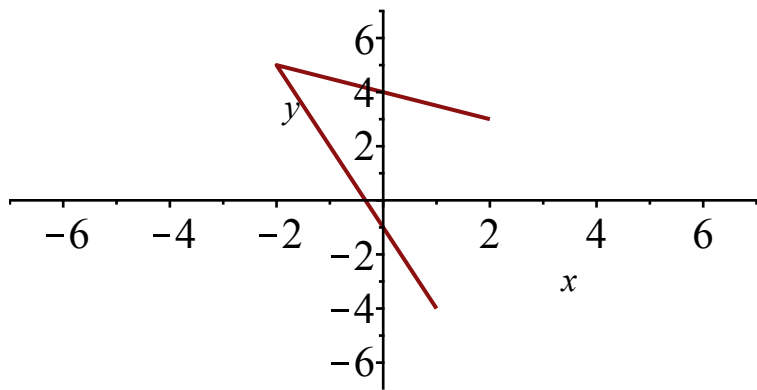
> `plot([cos(x), x2], x = -1..4, y = -4..4);`



> `plot([[2, 3], [-2, 5], [1, -4]], x = -7..7, y = -7..7, style = point);`



> `plot([[2, 3], [-2, 5], [1, -4]], x = -7..7, y = -7..7, style = line);`



> # Teil 4 : Gleichungen

> restart;

> solve($x^2 - 5 \cdot x + 3 = 0, x$);

$$\frac{5}{2} + \frac{\sqrt{13}}{2}, \frac{5}{2} - \frac{\sqrt{13}}{2} \quad (38)$$

> eqn1 := $3 \cdot x^3 - 4 \cdot x^2 - 43 \cdot x + 84 = 0$;

$$\text{eqn1} := 3x^3 - 4x^2 - 43x + 84 = 0 \quad (39)$$

> solve(eqn1, x);

$$-4, 3, \frac{7}{3} \quad (40)$$

> subs(x = 3, eqn1);

$$0 = 0 \quad (41)$$

> S := solve($x^3 - 34 \cdot x^2 + 4, x$);

$$S := \frac{(39250 + 6I\sqrt{117831})^{1/3}}{3} + \frac{1156}{3(39250 + 6I\sqrt{117831})^{1/3}} + \frac{34}{3}, \quad (42)$$

$$- \frac{(39250 + 6I\sqrt{117831})^{1/3}}{6} - \frac{578}{3(39250 + 6I\sqrt{117831})^{1/3}} + \frac{34}{3}$$

$$+ \frac{I\sqrt{3} \left(\frac{(39250 + 6I\sqrt{117831})^{1/3}}{3} - \frac{1156}{3(39250 + 6I\sqrt{117831})^{1/3}} \right)}{2},$$

$$- \frac{(39250 + 6I\sqrt{117831})^{1/3}}{6} - \frac{578}{3(39250 + 6I\sqrt{117831})^{1/3}} + \frac{34}{3}$$

$$- \frac{I\sqrt{3} \left(\frac{(39250 + 6I\sqrt{117831})^{1/3}}{3} - \frac{1156}{3(39250 + 6I\sqrt{117831})^{1/3}} \right)}{2}$$

> evalf(S);

$$33.99653908 - 2 \cdot 10^{-10} I, -0.3412885437 - 8.590254040 \cdot 10^{-9} I, 0.3447494437 + 8.730254040 \cdot 10^{-9} I \quad (43)$$

> sqrt(-1);

$$I \quad (44)$$

> fsolve($x^4 - x^3 - 17 \cdot x^2 - 6 \cdot x + 2 = 0, x$);

$$-3.414213562, -0.5857864376, 0.2087121525, 4.791287847 \quad (45)$$

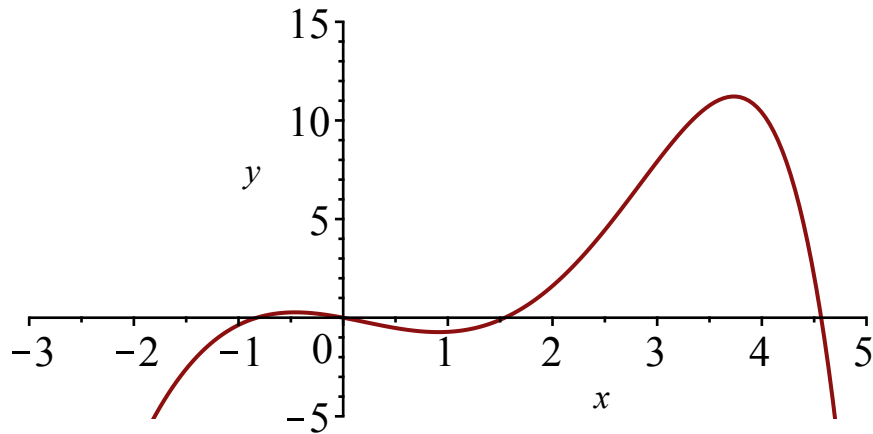
> eqn2 := $x^3 + 1 - \exp(x) = 0$;

$$\text{eqn2} := x^3 + 1 - e^x = 0 \quad (46)$$

```
> fsolve(eqn2, x);
```

0. (47)

```
> plot(x3 + 1 - exp(x), x = -3..5, y = -5..15);
```



```
> fsolve(eqn2, x = -1..-0.5);
```

-0.8251554697 (48)

```
> fsolve(eqn2, x = 1..2);
```

1.545007279 (49)

```
> soln4 := fsolve(eqn2, x = 4..5);
```

soln4 := 4.567036837 (50)

```
> fsolve(eqn2, x = 5..100);
```

$fsolve(x^3 + 1 - e^x = 0, x, 5..100)$ (51)

```
> evalf(subs(x = soln4, eqn2));
```

$-1.10^{-8} = 0.$ (52)

```
> solve({x + y = 1, 2 * x - y = 3});
```

$\left\{x = \frac{4}{3}, y = -\frac{1}{3}\right\}$ (53)

```
> solve({x + y + z = 1, 3 * x + y = 3});
```

$\{x = x, y = -3x + 3, z = 2x - 2\}$ (54)

> # Teil 5 : Definition und Evaluation von Funktionen

> restart;

> $g := t \rightarrow t^3 - 6 \cdot t^2 + 6 \cdot t + 8;$

$$g := t \mapsto t^3 - 6t^2 + 6t + 8 \quad (55)$$

> $g(2 + \text{sqrt}(5));$

$$(2 + \sqrt{5})^3 - 6(2 + \sqrt{5})^2 + 20 + 6\sqrt{5} \quad (56)$$

> evalf(%);

$$1.76393195 \quad (57)$$

> solve(g(t) = 0, t);

$$4, 1 - \sqrt{3}, 1 + \sqrt{3} \quad (58)$$

> fsolve(g(t) = 0, t);

$$-0.7320508076, 2.732050808, 4. \quad (59)$$

> fsolve(g(t) = 0, t, 2..3);

$$2.732050808 \quad (60)$$

> plot(g(x), x = -2..5, y = -10..10);

