```
> # Praktikum "Mathematik am Computer" (HS18) / Prof. H. Harbrecht;
  R. Brügger, S. Bruggmann, R. Dohrau
>
> # Maple-Beilageblätter zur Serie 5 (zur 43.
  KW)
>
>  # Teil 1 : Infinitesimalrechnung
> restart ;
> w := sin(3*x)/x;
```

$$w := \frac{\sin(3\,x)}{x} \tag{1}$$

```
> limit(w, x = 0);
```

$$3 \tag{2}$$

```
> f := x -> sin(3*x)/x;
```

$$f := x \mapsto \frac{\sin(3\,x)}{x} \tag{3}$$

```
> limit(f(x), x = 0);
```

$$3 \tag{4}$$

```
> Limit(f(x), x = 0);
```

$$\lim_{x \to 0} \frac{\sin(3\,x)}{x} \tag{5}$$

```
> value(%);
```

$$3 \tag{6}$$

```
> w := x^3 + 3*x^2 - 4*x + 7;
```

$$w := x^3 + 3\,x^2 - 4\,x + 7 \tag{7}$$

```
> wp := diff(w, x);
```

$$wp := 3\,x^2 + 6\,x - 4 \tag{8}$$

```
> wpp := diff(w, x $ 2);
```

$$wpp := 6\,x + 6 \tag{9}$$

```
> wppp := Diff(w, x $ 3);
```

$$wppp := \frac{d^3}{dx^3}\left(x^3 + 3\,x^2 - 4\,x + 7\right) \tag{10}$$

```
> value(%);
```

$$6 \tag{11}$$

```
> w := sin(x);
```

$$w := \sin(x) \tag{12}$$

```
> wS := int(w, x);
```

$$wS := -\cos(x) \tag{13}$$

```
> Int(w, x); value(%);
```

$$\int \sin(x) \, dx$$

$$-\cos(x) \tag{14}$$

> $f := x \rightarrow \sin(x) * x;$

$$f := x \mapsto \sin(x) \, x \tag{15}$$

> $fS := int(f(x), x);$

$$fS := \sin(x) - \cos(x) \, x \tag{16}$$

> $Int(f(x), x = 0 .. 1);$

$$\int_0^1 \sin(x) \, x \, dx \tag{17}$$

> $value(\%);$

$$\sin(1) - \cos(1) \tag{18}$$

> $evalf(\%);$

$$0.3011686789 \tag{19}$$

> $sum(1/n\wedge2, n = 1 .. infinity);$

$$\frac{\pi^2}{6} \tag{20}$$

> $Sum(n\wedge3, n = 1 .. N); value(\%);$

$$\sum_{n=1}^{N} n^3$$

$$\frac{(N+1)^4}{4} - \frac{(N+1)^3}{2} + \frac{(N+1)^2}{4} \tag{21}$$

> # Teil 2 : Lineare Algebra

> *restart*;

> *with*(*linalg*):

> $A := matrix(2, 2, [10, 11, 12, 13])$;

$$A := \begin{bmatrix} 10 & 11 \\ 12 & 13 \end{bmatrix}$$ (22)

> $A[1, 2]$;

$$11$$ (23)

> $row(A, 1); col(A, 2)$;

$$\begin{bmatrix} 10 & 11 \end{bmatrix}$$

$$\begin{bmatrix} 11 & 13 \end{bmatrix}$$ (24)

> $v := vector([1, 3]); w := vector([2, 4])$;

$$v := \begin{bmatrix} 1 & 3 \end{bmatrix}$$

$$w := \begin{bmatrix} 2 & 4 \end{bmatrix}$$ (25)

> $A := augment(v, w)$;

$$A := \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$ (26)

> $b := vector([5, 6])$;

$$b := \begin{bmatrix} 5 & 6 \end{bmatrix}$$ (27)

> $multiply(A, b)$;

$$\begin{bmatrix} 17 & 39 \end{bmatrix}$$ (28)

> $multiply(b, A)$;

$$\begin{bmatrix} 23 & 34 \end{bmatrix}$$ (29)

> $E := matrix(2, 2, [x^2*y, y*x, \sin(x), 1/x])$;

$$E := \begin{bmatrix} x^2 y & y x \\ \sin(x) & \dfrac{1}{x} \end{bmatrix}$$ (30)

> $multiply(A, E)$;

$$\begin{bmatrix} x^2 y + 2 \sin(x) & y x + \dfrac{2}{x} \\ 3 x^2 y + 4 \sin(x) & 3 y x + \dfrac{4}{x} \end{bmatrix}$$ (31)

> $B := matrix(3, 3, [1, 2, 3, 4, 5, 6, 7, 8, 9])$;

(32)

$$B := \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

(32)

> $C := matrix(3, 3, [3, 2, 1, 5, 6, 4, 9, 7, 8]);$

$$C := \begin{bmatrix} 3 & 2 & 1 \\ 5 & 6 & 4 \\ 9 & 7 & 8 \end{bmatrix}$$

(33)

> $inverse(C);$

$$\begin{bmatrix} \dfrac{20}{33} & -\dfrac{3}{11} & \dfrac{2}{33} \\[2mm] -\dfrac{4}{33} & \dfrac{5}{11} & -\dfrac{7}{33} \\[2mm] -\dfrac{19}{33} & -\dfrac{1}{11} & \dfrac{8}{33} \end{bmatrix}$$

(34)

> $det(C);$

$$33$$

(35)

> $det(E);$

$$y\,x - y\,x\,\sin(x)$$

(36)

> $transpose(C);$

$$\begin{bmatrix} 3 & 5 & 9 \\ 2 & 6 & 7 \\ 1 & 4 & 8 \end{bmatrix}$$

(37)

> $trace(C);$

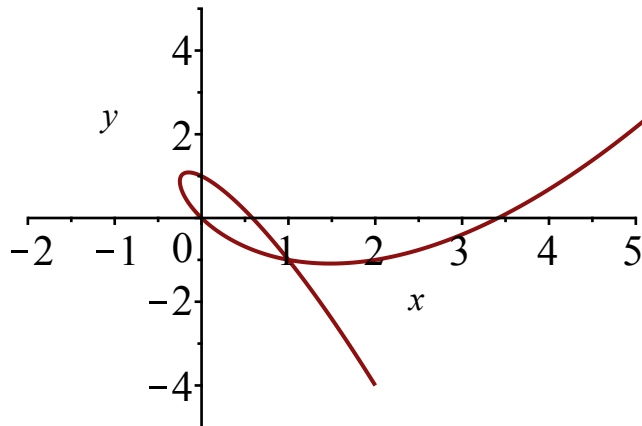$$17$$

(38)

> $evalm(B \&* C^2 + B \&* C - inverse(C) \&* B^2);$

$$\begin{bmatrix} \dfrac{6882}{11} & \dfrac{6035}{11} & \dfrac{5155}{11} \\[2mm] \dfrac{15480}{11} & \dfrac{13643}{11} & \dfrac{11575}{11} \\[2mm] \dfrac{24096}{11} & \dfrac{21269}{11} & \dfrac{18013}{11} \end{bmatrix}$$
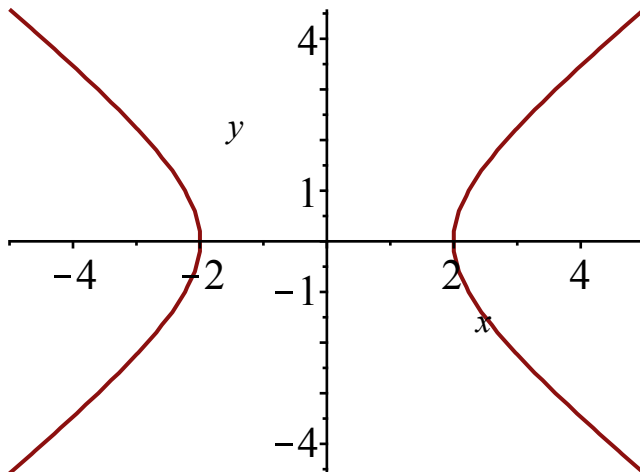
(39)

> # Teil 3 : Grafiken
> *restart*;
> *with* (*plots*):
> $plot([t^2-t, 2*t-t^3, t=-2..2], x=-2..5, y=-5..5);$

> $implicitplot(x^2/4-y^2/4 = 1, x=-5..5, y=-5..5);$

> $display(seq(plot(k*x+1, x=-5..5, y=-5..5), k=1..20));$
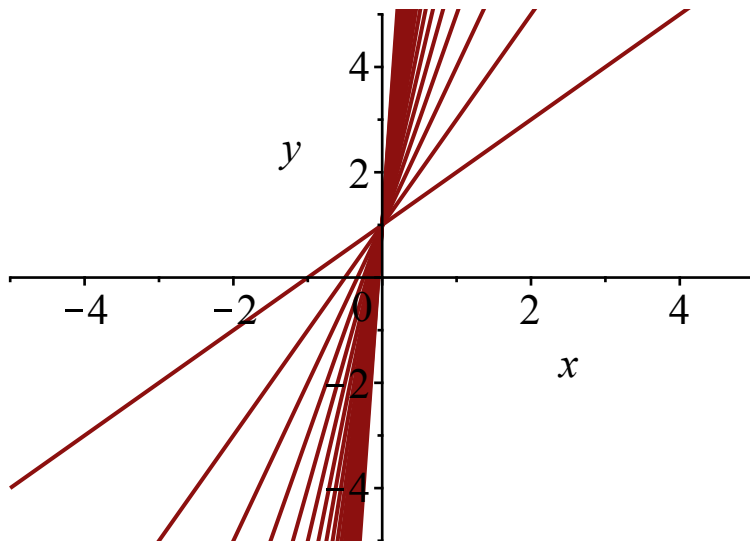
> $plot3d(x^2+y^2, x=-3..3, y=-3..3, axes = boxed);$
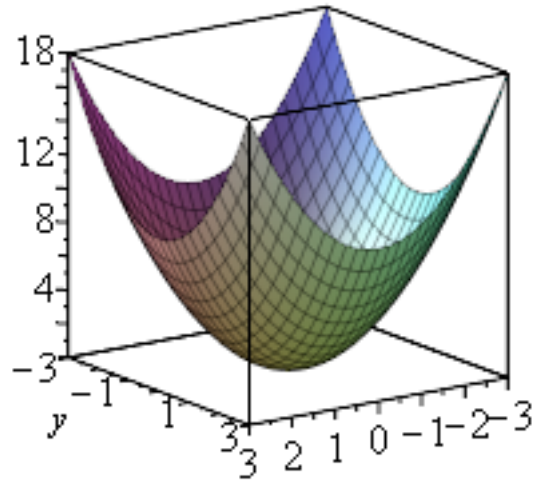
> $plot3d([u, v, u\wedge2 + v\wedge2], u = -3..3, v = -3..3, axes = boxed);$