

Cornelsen S. 112, Nr. 21

(%i1) "Funktionsuntersuchung"\$

```
(%i2) f(x) := (x^4 + 16)/(4*x^2);
```

$$(\%o2) \quad f(x) := \frac{x^4 + 16}{4x^2}$$

(%i3) "Schnittpunkt mit y-Achse" \$

(%i4) f(0);

```
expt: undefined: 0 to a negative exponent.  
#0: f(x=0)  
-- an error. To debug this try: debugmode(true);
```

(%i5) "Nullstellen"\$

```
(%i6) solve((x^4 + 16) /(4*x^2)= 0, x);
```

```

(%o6) [x = 2 (- 1)^(1/4), x = - 2 (- 1)^(1/4), x = - 2 (- 1)^(1/4), x = 2 (- 1)^(1/4)]

```

```
(%i7) ev(% ,numer);
```

(%i8) "1. Ableitung" \$

```
(%i9) diff(f(x),x);
```

$$\begin{array}{r}
 & & 4 \\
 & x & + 16 \\
 x & - & \hline
 & 3 \\
 & 2x
 \end{array}$$

(%o9)

(%i10) sqfr(%);

(%o10)
$$\begin{array}{r} 4 \\ x - 16 \\ \hline 3 \\ 2x \end{array}$$

(%i11) "Mögliche Extremstellen"\$

```
(%i12) solve( %th(2) = 0,x);
(%o12) [x = 2 %i, x = - 2, x = - 2 %i, x = 2]
```

```
(%i13) ev(%,numer);  
(%o13) [x = 2 %i, x = - 2, x = - 2 %i, x = 2]
```

(%i14) "2. Ableitung" \$

```
(%j15) diff(f(x), x, 2)
```

$$\begin{array}{r}
 (\%15) \quad \text{div}((1(x), x, 2)) \\
 (\%15) \quad \begin{array}{r}
 3(x^4 + 16) \\
 \hline
 2x
 \end{array}
 \end{array}$$

(%i16) sagfr(%):

```
(%16) 3qri (%),  
        4  
x + 48  
-----  
        4  
2 x
```

```
(%i17) "Mögliche Wendestellen"$

(%i18) solve( %th(2) = 0,x);
      1/4 1/4           1/4 1/4
(%o18) [x = 2 (- 1)   3   %i, x = - 2 (- 1)   3   ,
      1/4 1/4           1/4 1/4
      x = - 2 (- 1)   3   %i, x = 2 (- 1)   3   ]

```

```
(%i19) ev(%,numer);
      0.25           0.25
(%o19) [x = 2.632148025904985 (- 1)   %i, x = - 2.632148025904985 (- 1)   ,
      0.25           0.25
      x = - 2.632148025904985 (- 1)   %i, x = 2.632148025904985 (- 1)   ]

```

(%i20) "3. Ableitung"\$

```
(%i21) diff(f(x),x,3) ;
      4
      6   6 (x  + 16)
(%o21) -----
      x      5
      x
```

```
(%i22) sqfr(%);
      96
(%o22) -----
      5
      x
```

(%i23) "Stammfunktion"\$

```
(%i24) integrate(f(x), x);
      3
      x   16
      -- - --
      3   x
      ----- 4
(%o24)
```

```
(%i25) sqfr(%);
      4
      x   - 48
      ----- 12 x
(%o25)
```

