

Quadratische Funktion

Dokumentnummer: DX1023

Fachgebiet: Gleichungen

Gleichungssysteme

umgekehrte Kurvendiskussion

Parabel

Kegelschnitte

Quelle: Tietze

1 Nullstellen



Figure 1:

Man ermittle die Nullstellen folgender quadratischer Polynome:

a) $f: f(x) = -x^2 + 7x + 16$

b) $g: g(p) = 2p^2 + 6p + 18$

c) $h: h(y) = 1,2y^2 - 24y + 198$

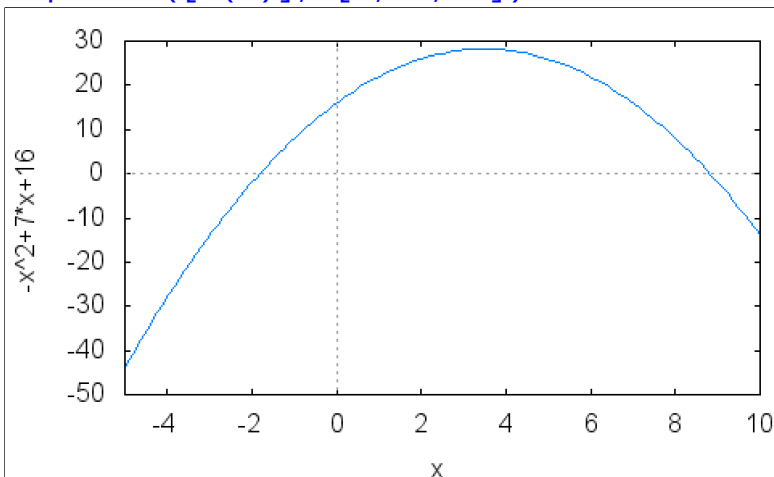
Teilaufgabe (a)

```
(%i1) f:f(x):=-x**2+7*x+16;
```

```
(%o1) f(x):=-x^2+7 x+16
```

```
(%i2) wxplot2d([f(x)], [x, -5, 10])$
```

```
(%t2)
```

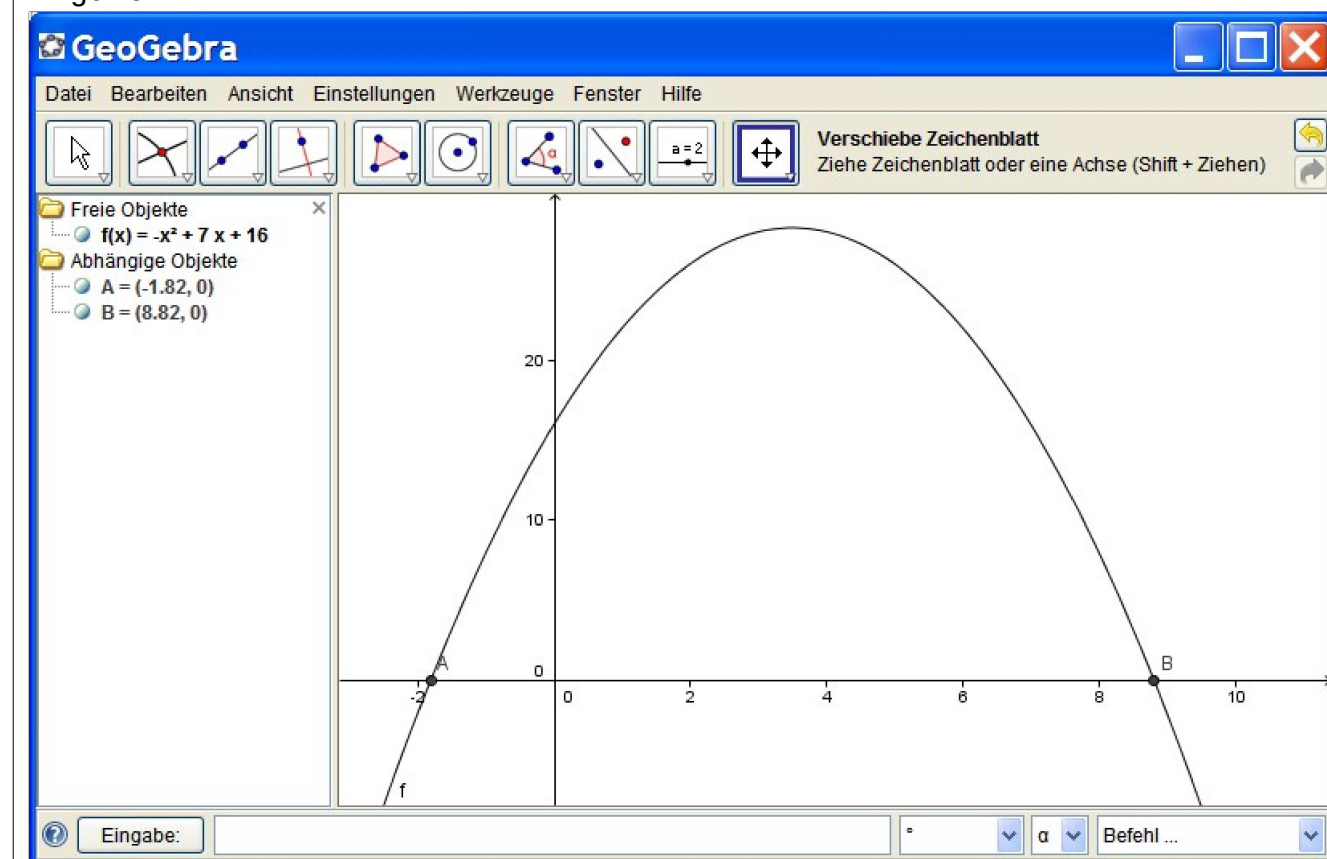


```
(%i3) l:realroots(f(x)),numer;
```

```
(%o3) [x=-1.815072923898697, x=8.815072923898697]
```

Kontrolle mit Geogebra

Figure 2:

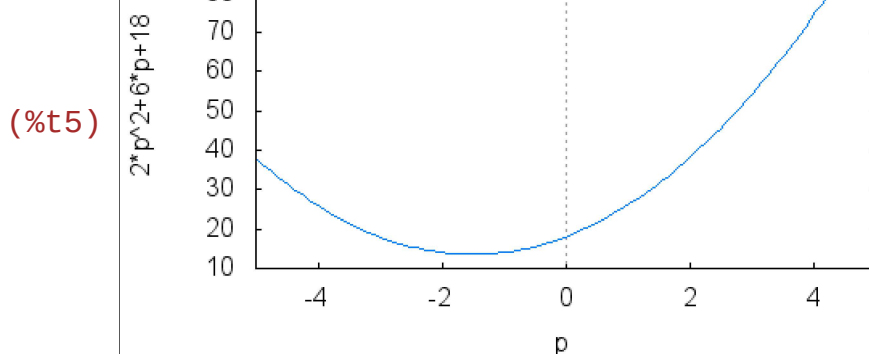


Teilaufgabe (b)

```
(%i4) g:g(p):=2*p**2+6*p+18;
```

```
(%o4) g(p):=2 p^2+6 p+18
```

```
(%i5) wxplot2d([g(p)], [p, -5, 5])$
```



```
(%i6) l:realroots(g(p));
```

```
(%o6) []
```

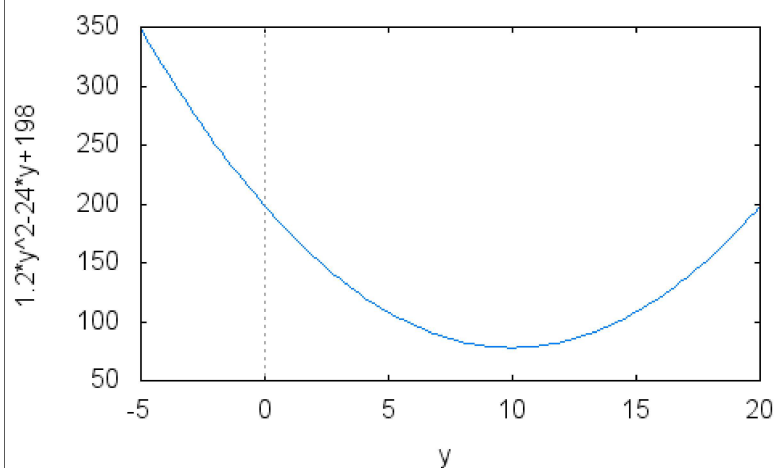
Teilaufgabe (c)

```
(%i7) h:h(y):=1.2*y**2-24*y+198;
```

```
(%o7) h(y):=1.2 y^2 - 24 y + 198
```

```
(%i8) wxplot2d([h(y)], [y, -5, 20])$
```

```
(%t8)
```



```
(%i9) l:realroots(h(y));
```

```
(%o9) []
```

□ 2 3 Punkte bestimmen eine Parabel eindeutig

Figure 3:

Wie lautet die Gleichung der Parabel, die durch folgende Punkte verläuft?

a) P(0; 3) ; Q(2; 4) ; R(4; 8) b) A(2; 0) ; B(14; 1) ; C(-6; -1)

Teilaufgabe (a)

```
(%i10) P:[0,3];Q:[2,4];R:[4,8];
```

```
(%o10) [0,3]
```

```
(%o11) [2,4]
```

```
(%o12) [4,8]
```

```
(%i13) g(x,y):=y=a*x**2+b*x+c;
```

```
(%o13) g(x,y):=y=a x^2+b x+c
```

```
(%i14) g1:g(P[1],P[2]);
```

```
(%o14) 3=c
```

```
(%i15) g2:g(Q[1],Q[2]);
```

```
(%o15) 4=c+2 b+4 a
```

```
(%i16) g3:g(R[1],R[2]);
```

```
(%o16) 8=c+4 b+16 a
```

```
(%i17) l:solve([g1,g2,g3],[a,b,c]);
```

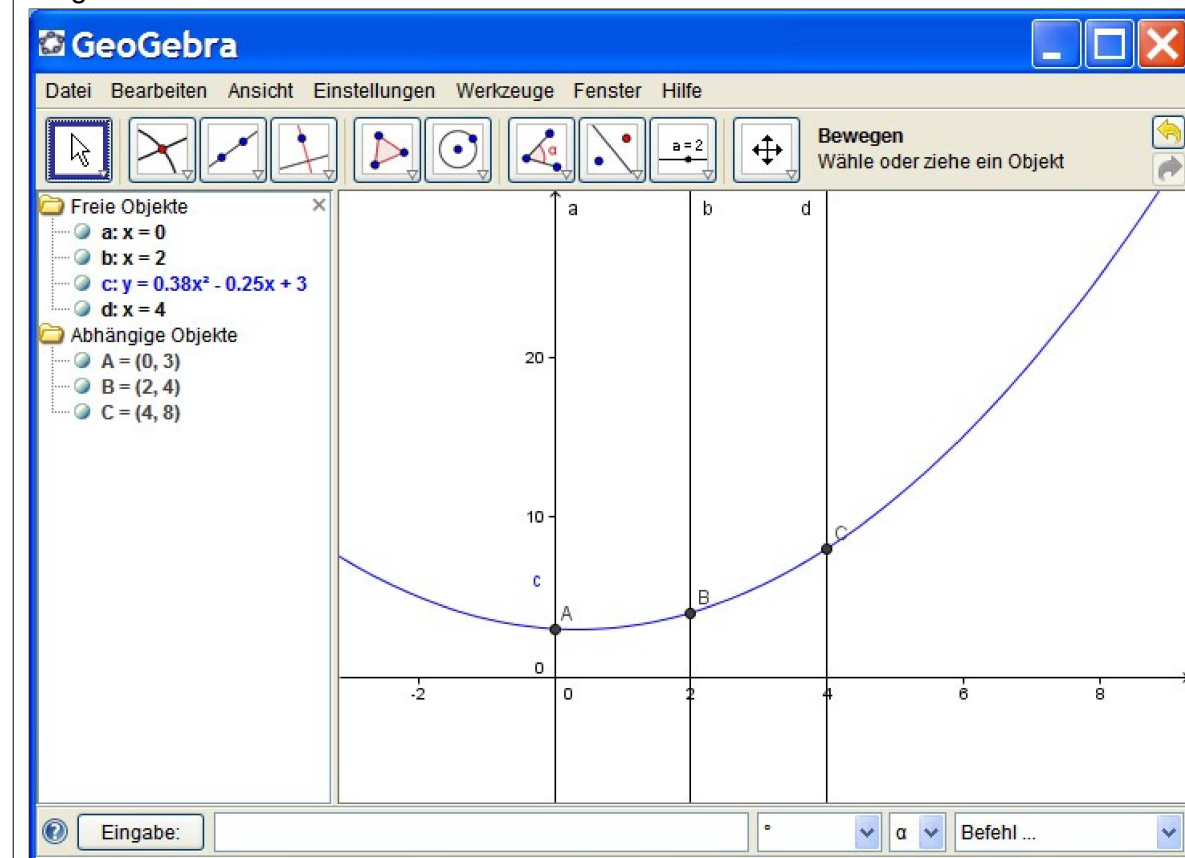
```
(%o17) [[a=3/8, b=-1/4, c=3]]
```

```
(%i18) Parabel:y=a*x**2+b*x+c, l;
```

```
(%o18) y=3/8 x^2 - 1/4 x + 3
```

Kontrolle mit Geogebra

Figure 4:



Teilaufgabe (b)

```
(%i19) A:[2,0];B:[14,1];C:[-6,-1];
(%o19) [2,0]
(%o20) [14,1]
(%o21) [-6,-1]

(%i22) g1:g(A[1],A[2]);
(%o22) 0=c+2 b+4 a

(%i23) g2:g(B[1],B[2]);
(%o23) 1=c+14 b+196 a

(%i24) g3:g(C[1],C[2]);
(%o24) -1=c-6 b+36 a

(%i25) l:solve([g1,g2,g3],[a,b,c]);
(%o25) [[a=-1/480,b=7/60,c=-9/40]]

(%i26) Parabel:y=a*x**2+b*x+c,l;
(%o26) y=-x^2/480+7x/60-9/40
```