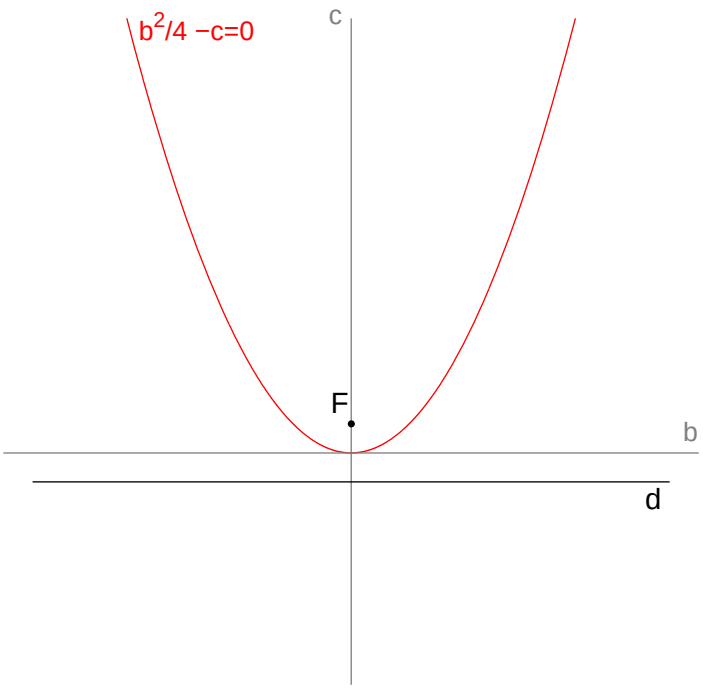
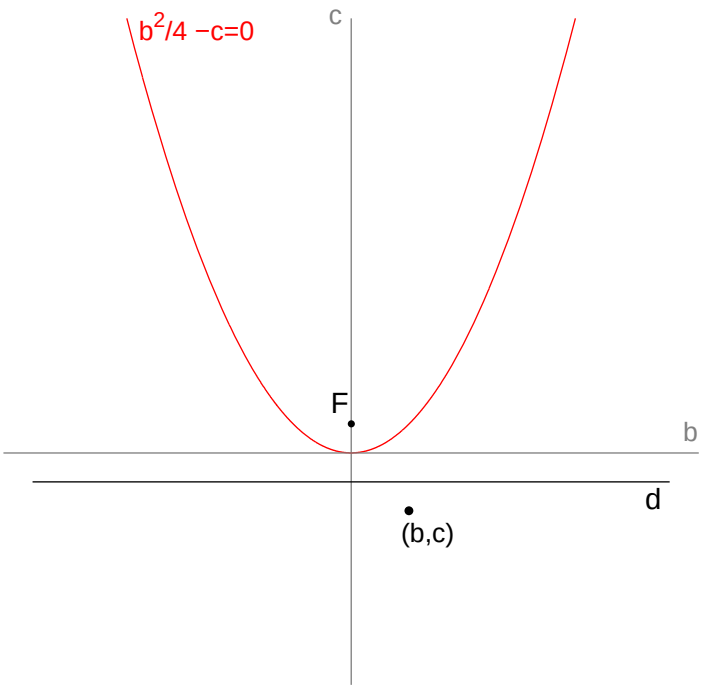
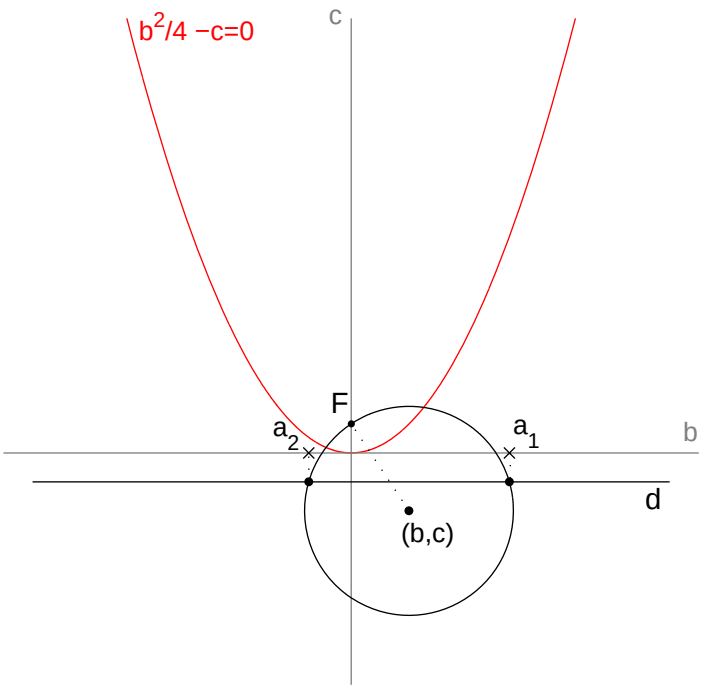
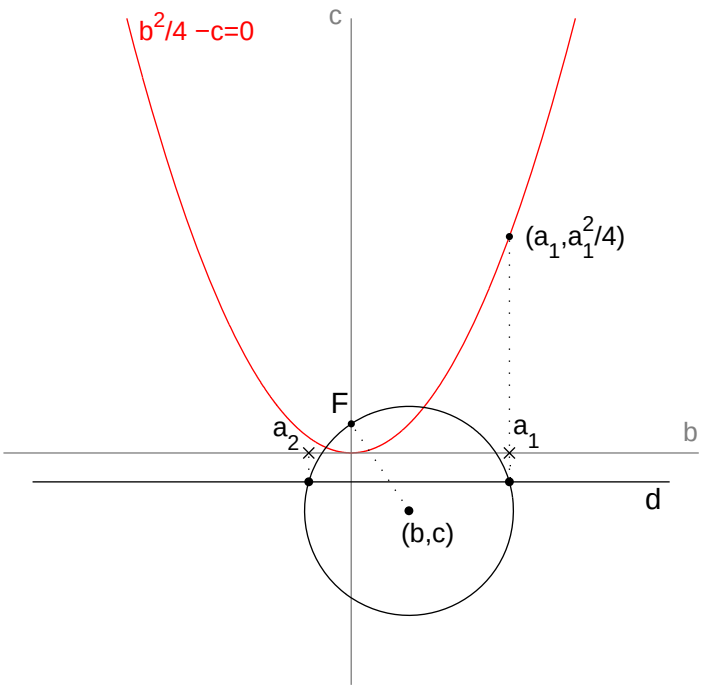
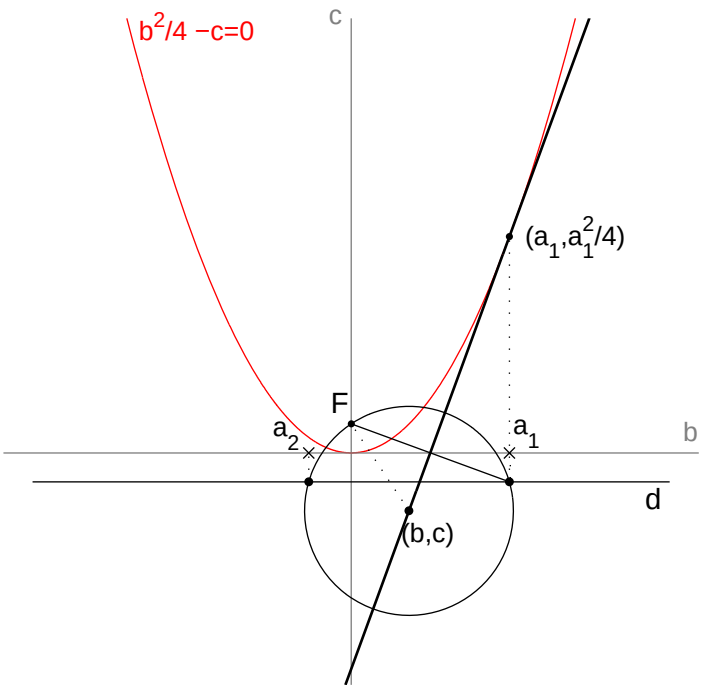
’’Una proposta didattica per un approccio geometrico alle equazioni di secondo e terzo grado’’

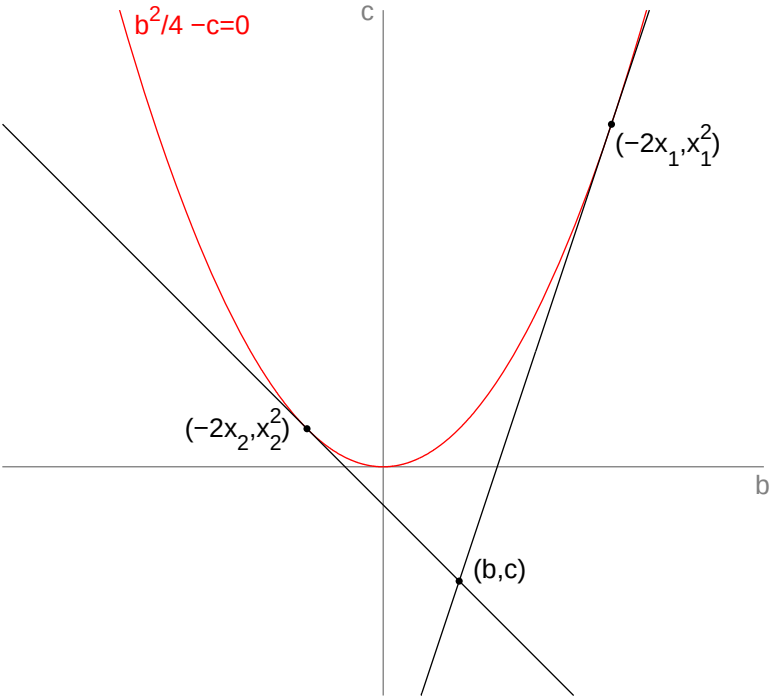

b²/4 −c=0
c
F
b
d

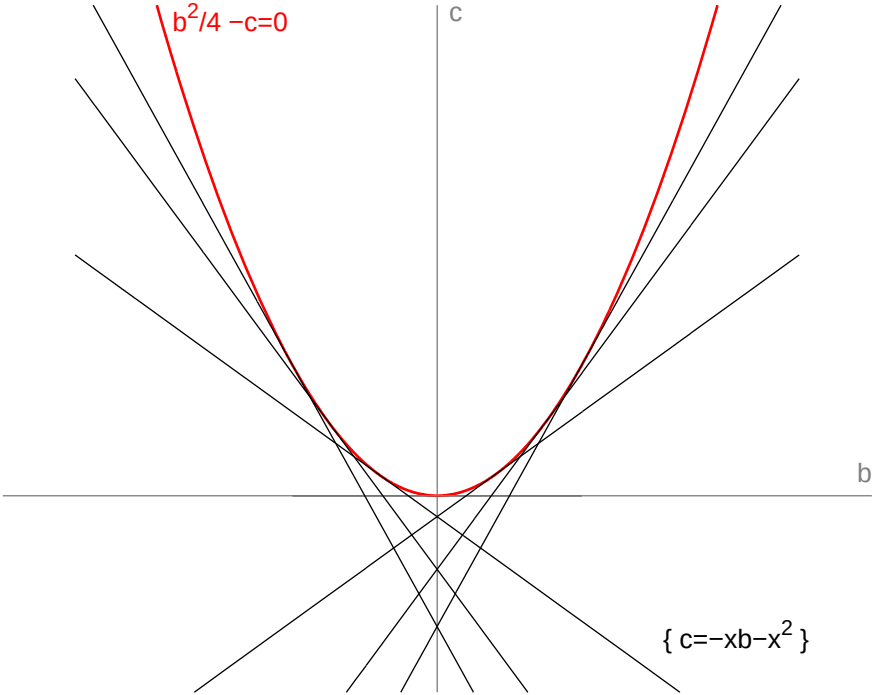

b2/4 −c=0
c
F
b
d
(b,c)

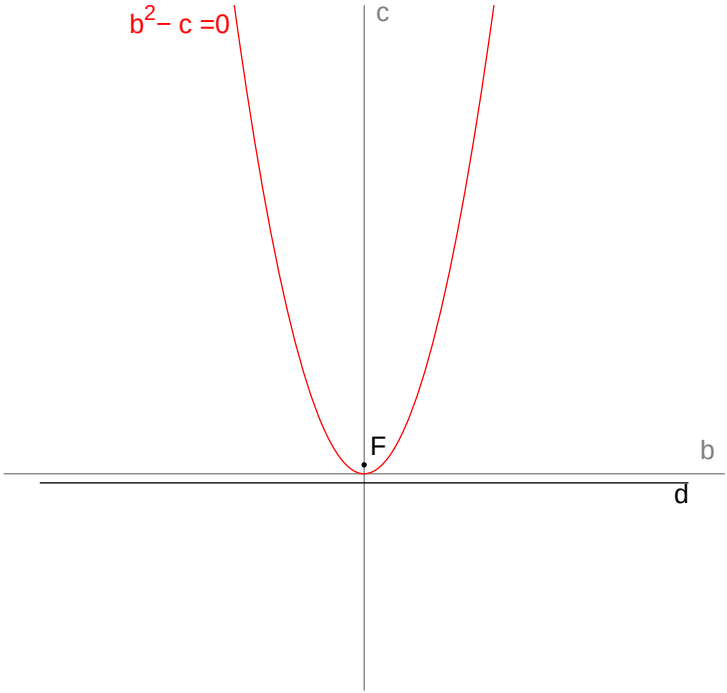

b²/4 −c=0
c
F
a2
a1
b
d
(b,c)

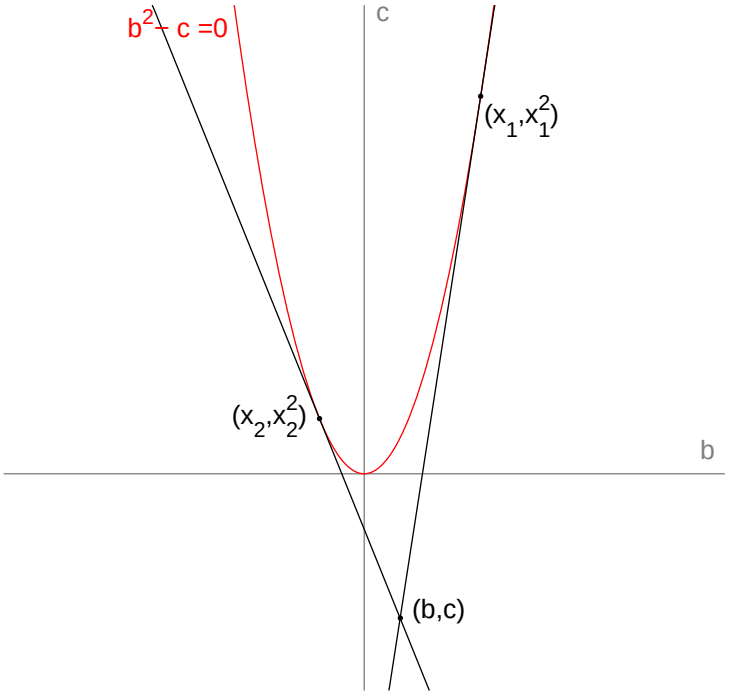

b²/4 −c=0
c
(a1,a1²/4)
F
a2
a1
b
d
(b,c)

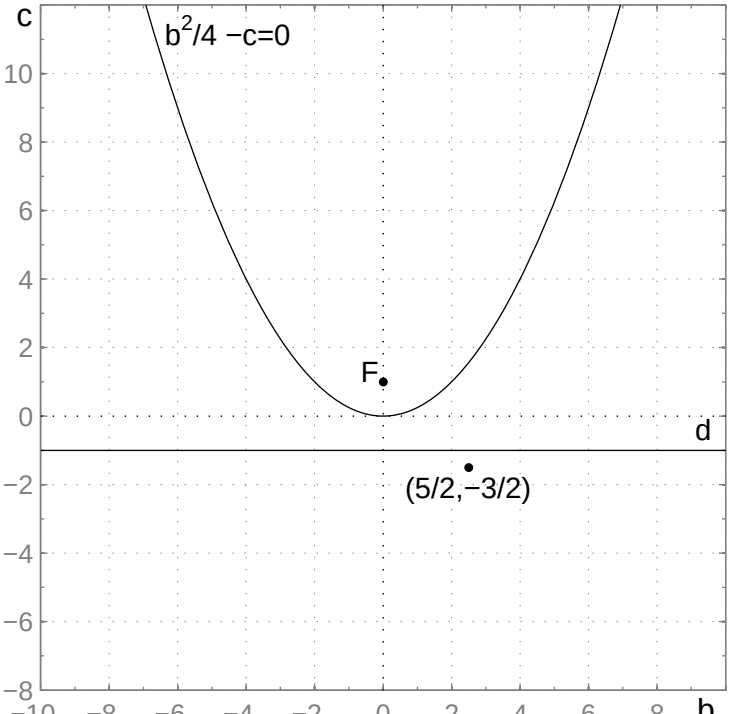

b²/4 −c=0
c
(a1,a1²/4)
F
a2
a1
b
d
(b,c)

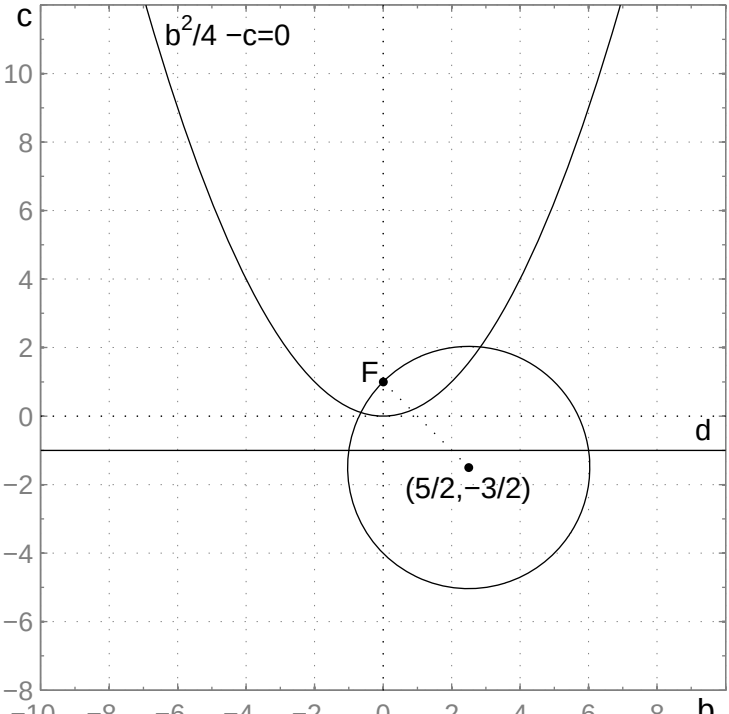

$b^2/4 - c = 0$
c
b
$(-2x_1, x_1^2)$
$(-2x_2, x_2^2)$
(b,c)

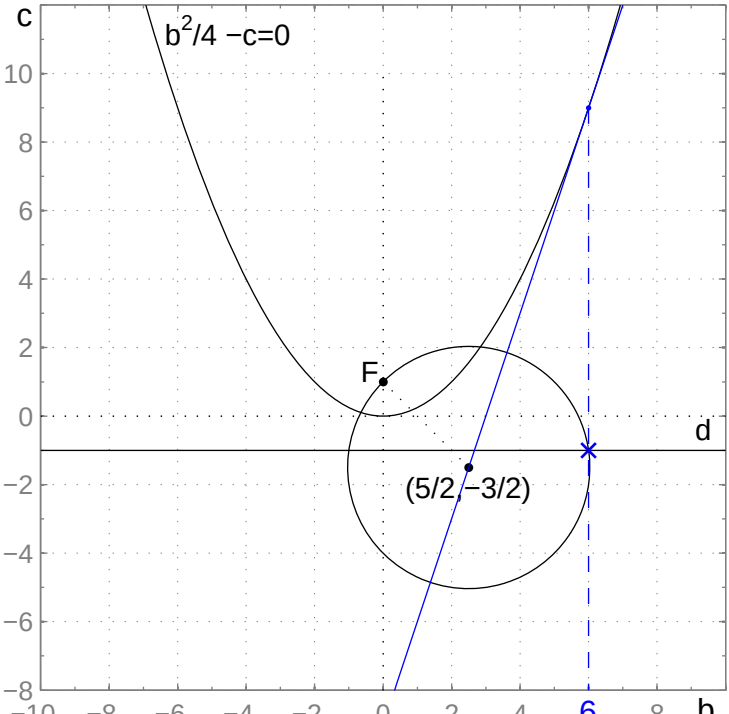

$b^2/4 - c = 0$
c
b
$\{ c = -xb - x^2 \}$

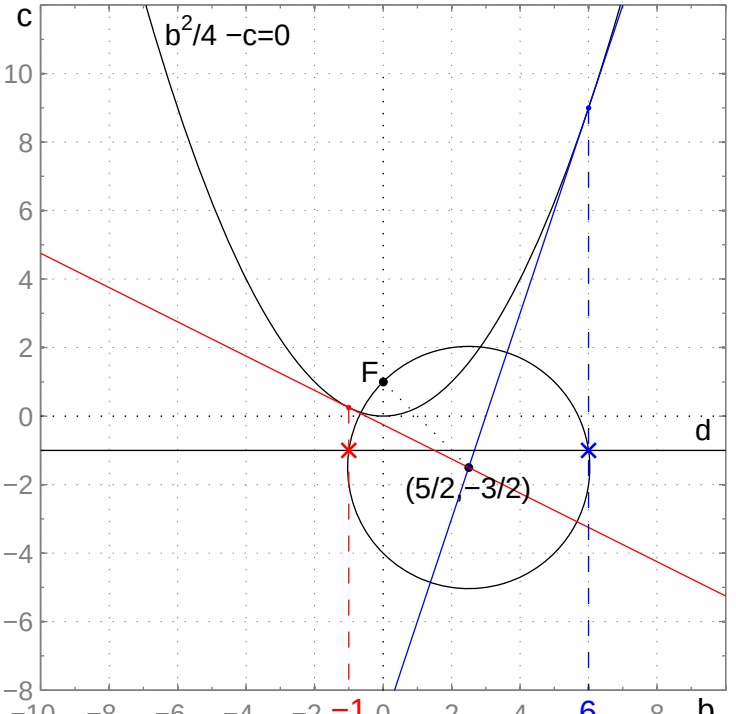

b2− c =0
c
F
b
d

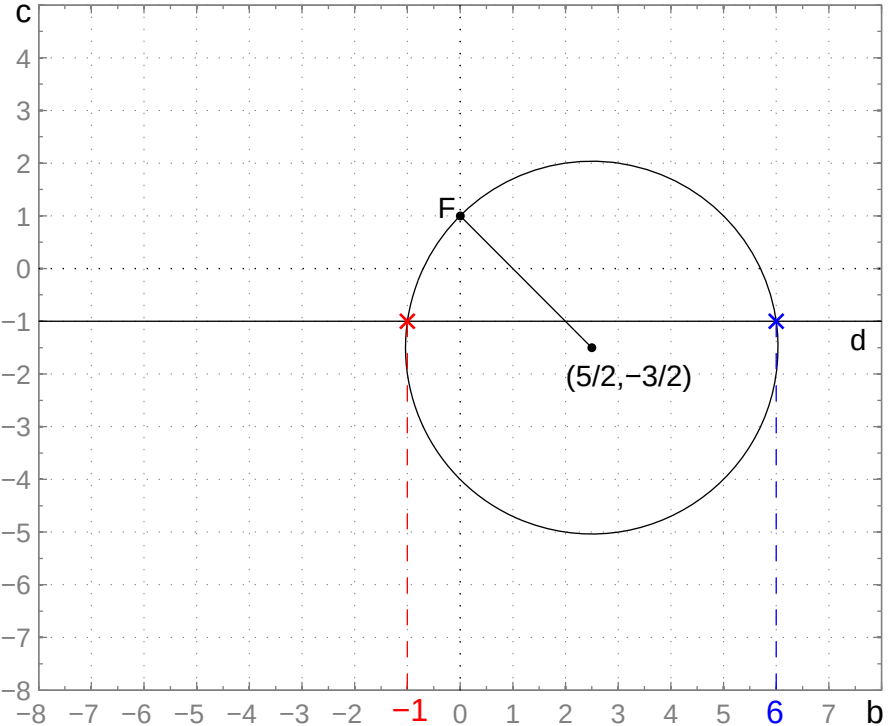

b2 – c =0
c
b
(x1,x12)
(x2,x22)
(b,c)

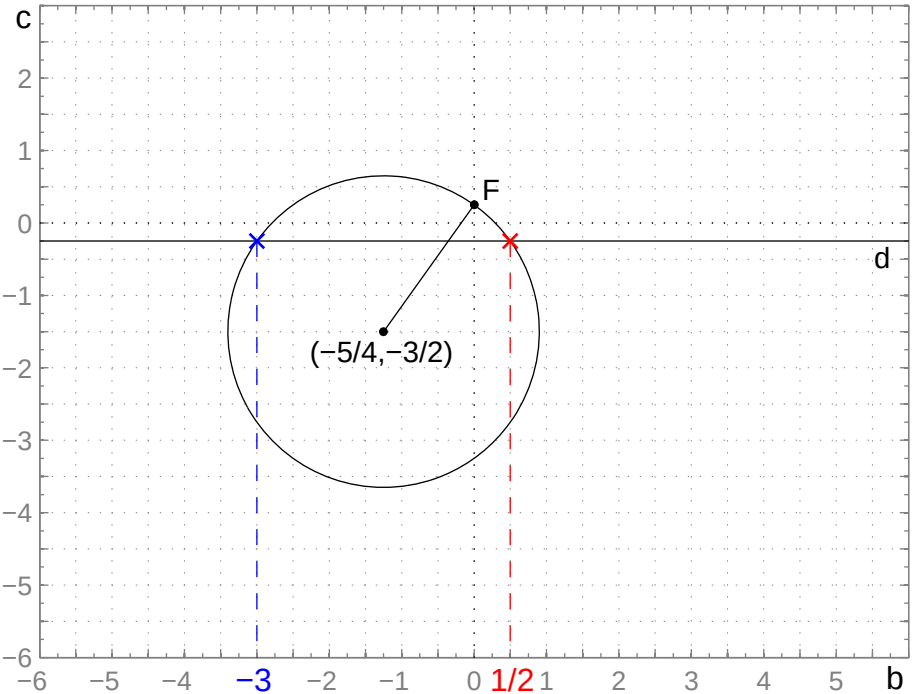

c
b
b²/4 −c=0
F
d
(5/2,−3/2)
10
8
6
4
2
0
−2
−4
−6
−8
−10
−8
−6
−4
−2
0
2
4
6
8

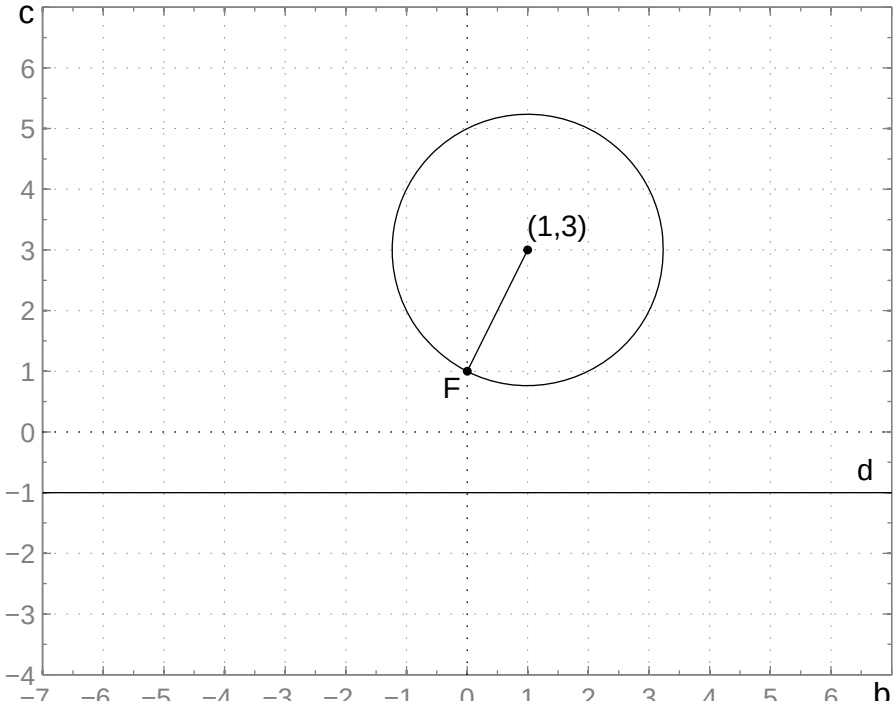

c
b
b²/4 −c=0
F
d
(5/2,−3/2)
10
8
6
4
2
0
−2
−4
−6
−8
−10
−8
−6
−4
−2
0
2
4
6
8

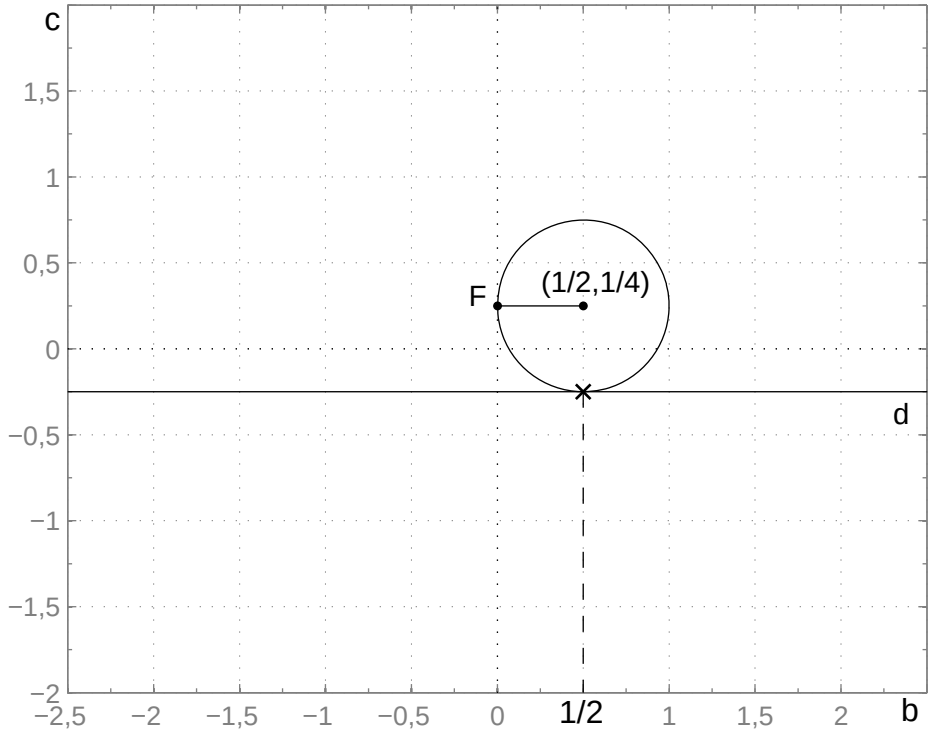

c
b²/4 −c=0
F
d
(5/2, −3/2)
6
b
10
8
6
4
2
0
−2
−4
−6
−8
−10
−8
−6
−4
−2
0
2
4
6
8

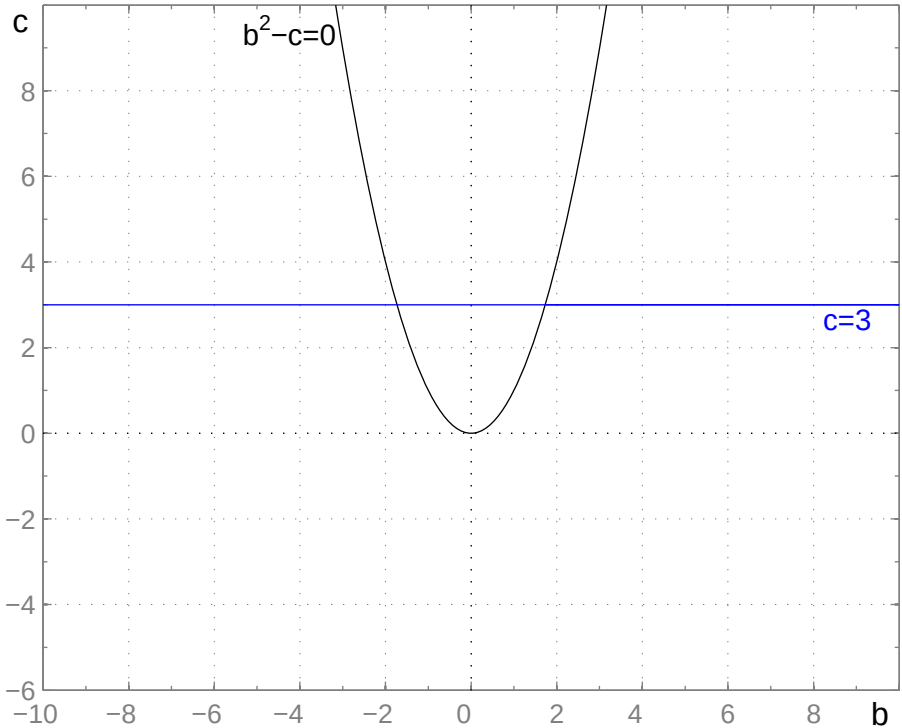

c
b²/4 −c=0
F
d
(5/2, −3/2)
−1
6
b

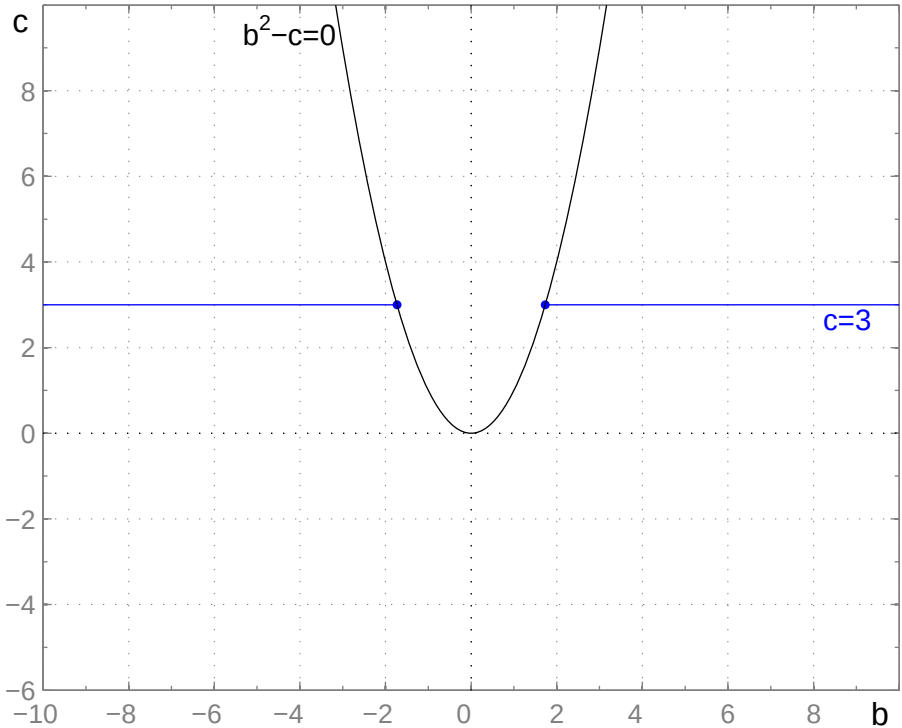

c
b
d
F
(5/2,−3/2)
−1
6
4
3
2
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−8
−7
−6
−5
−4
−3
−2
0
1
2
3
4
5
7

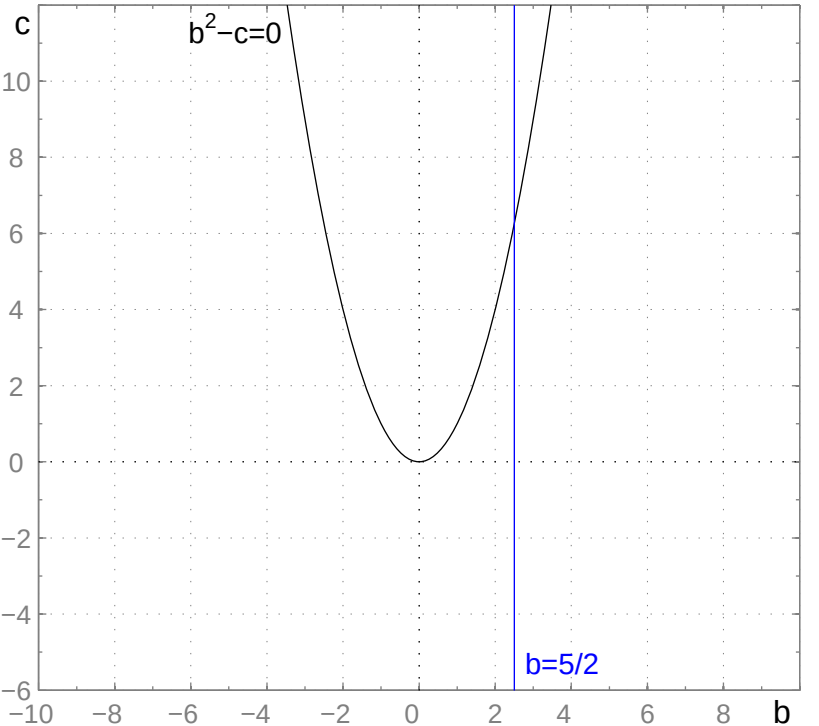

c
d
b
F
(−5/4,−3/2)
−3
1/2
2
1
0
−1
−2
−3
−4
−5
−6
−6
−5
−4
−2
−1
1
2
3
4
5

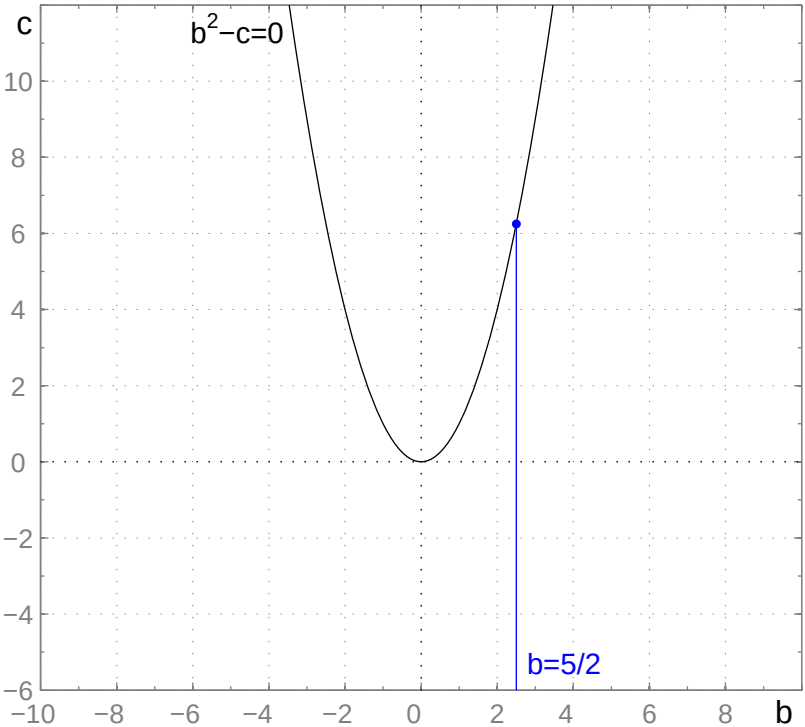

c
6
5
4
3
2
1
0
−1
−2
−3
−4
(1,3)
F
d
−7
−6
−5
−4
−3
−2
−1
0
1
2
3
4
5
6
b

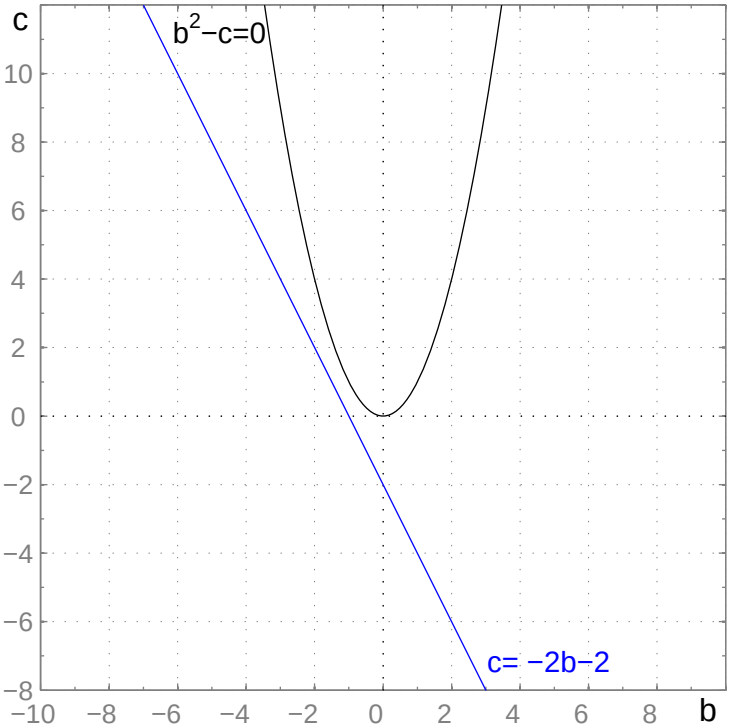

c
1,5
1
0,5
0
−0,5
−1
−1,5
−2
−2,5
−2
−1,5
−1
−0,5
0
1/2
1
1,5
2
b
F
(1/2,1/4)
d

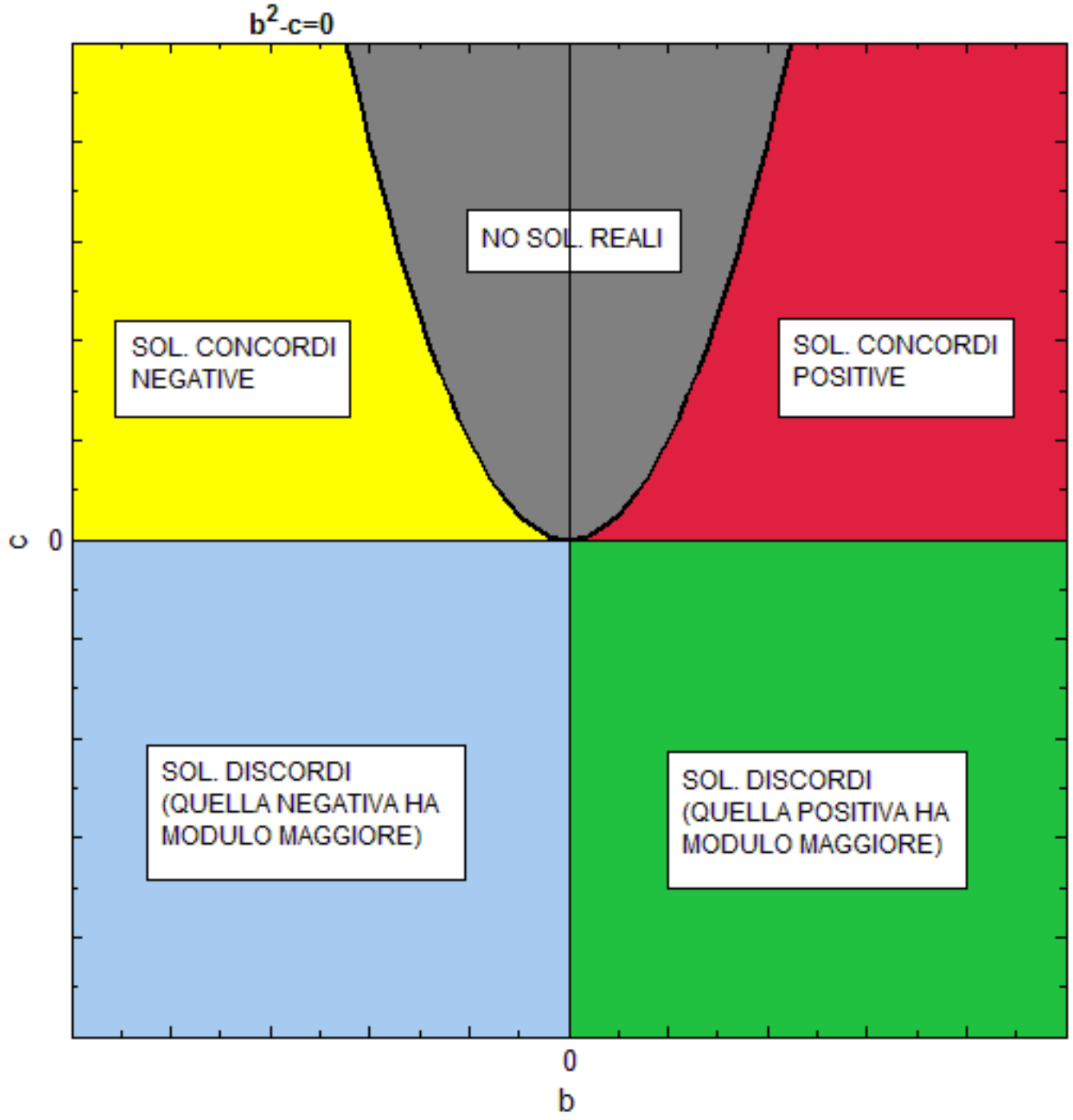

c
b
b2−c=0
c=3
8
6
4
2
0
−2
−4
−6
−10
−8
−6
−4
−2
0
2
4
6
8

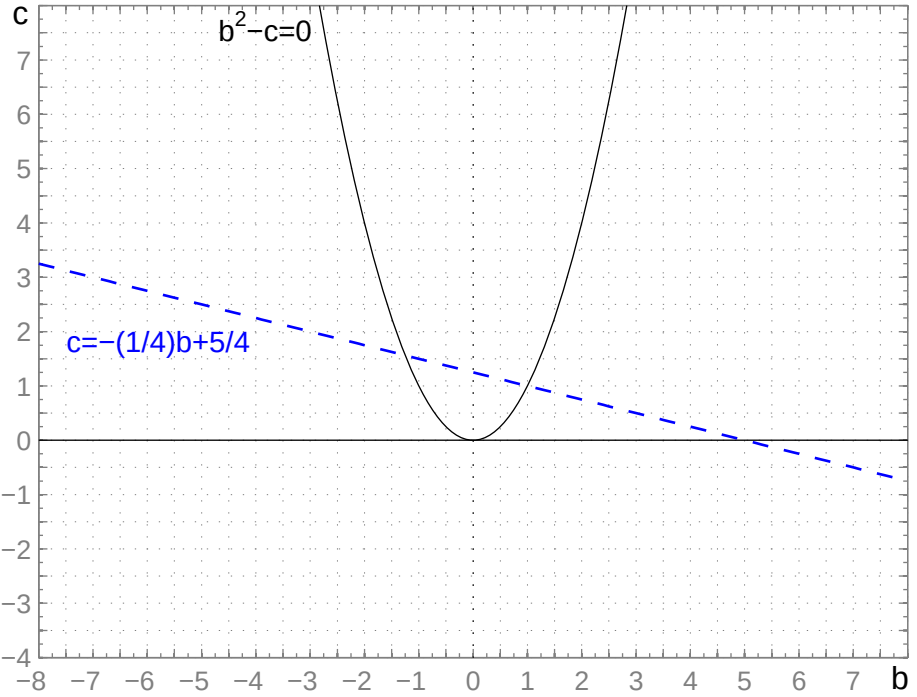

c
b
b2−c=0
c=3
8
6
4
2
0
−2
−4
−6
−10
−8
−6
−4
−2
0
2
4
6
8

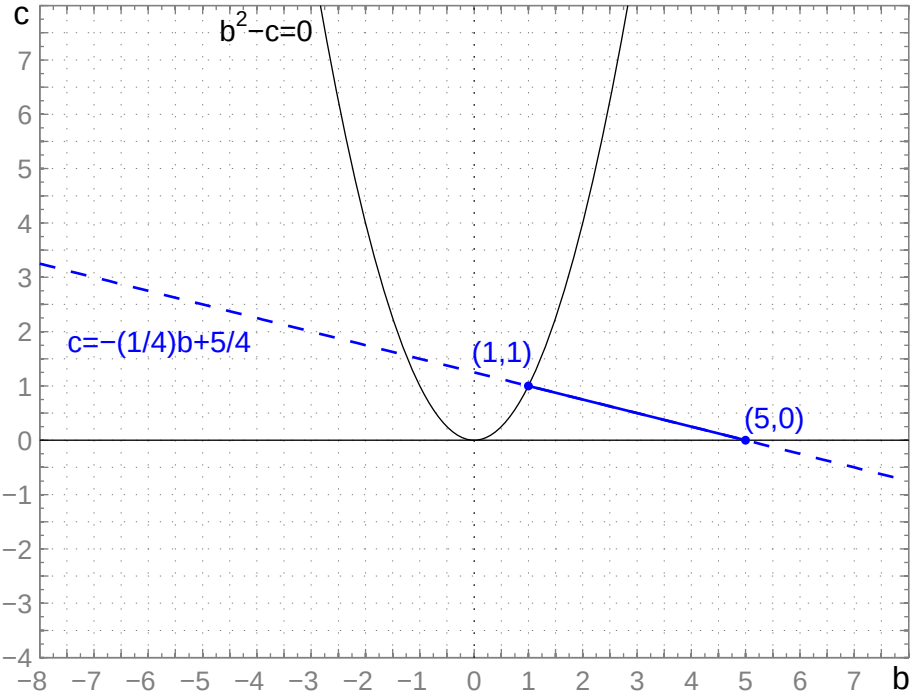

c
b
b²−c=0
b=5/2
10
8
6
4
2
0
−2
−4
−6
−10
−8
−6
−4
−2
0
2
4
6
8

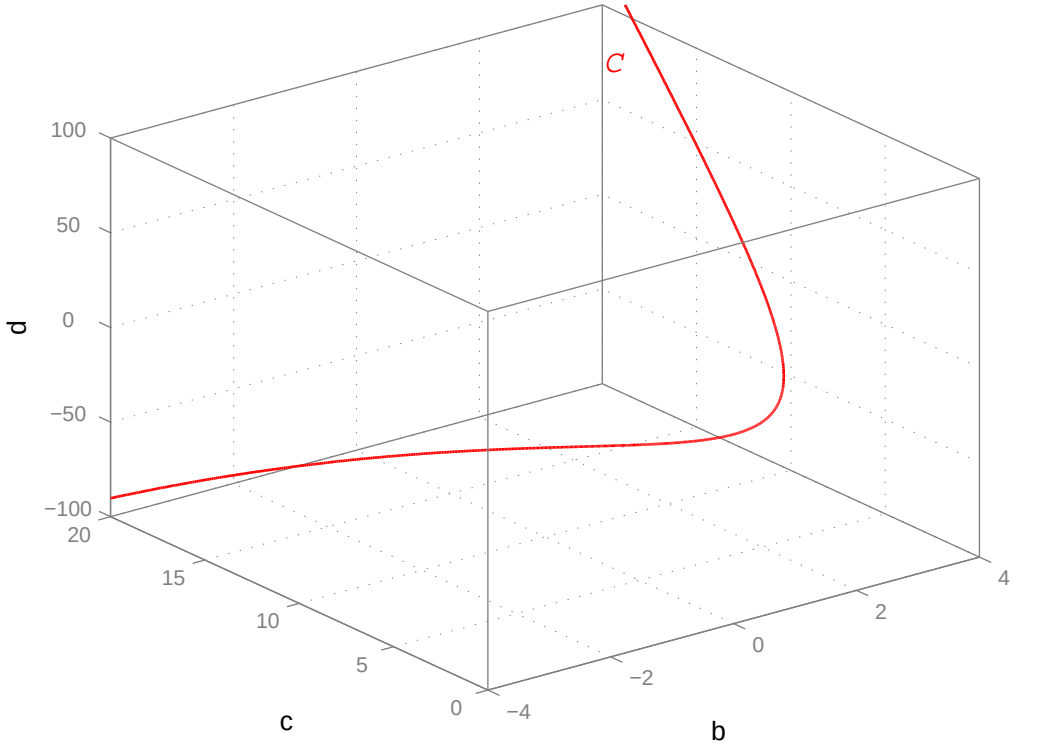

c
b
b²−c=0
b=5/2
10
8
6
4
2
0
−2
−4
−6
−10
−8
−6
−4
−2
0
2
4
6
8

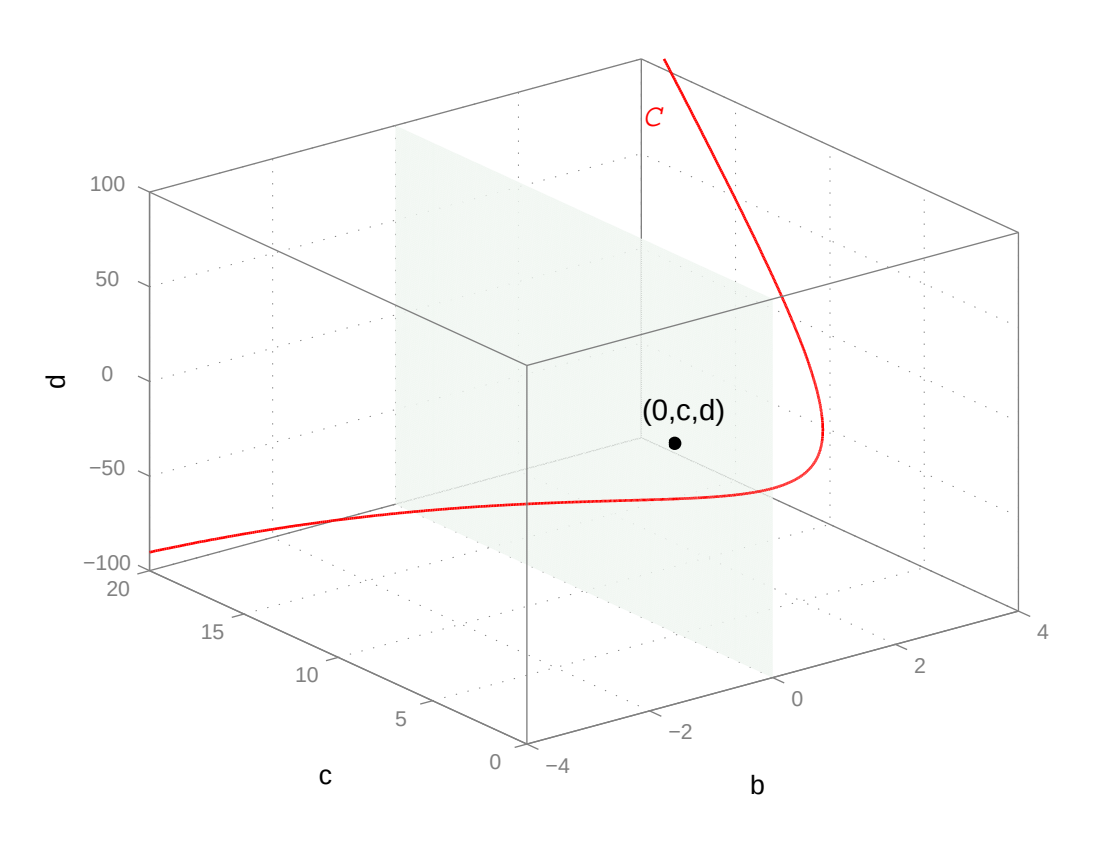

c
b
b2−c=0
c= −2b−2
10
8
6
4
2
0
−2
−4
−6
−8
−10
−8
−6
−4
−2
0
2
4
6
8

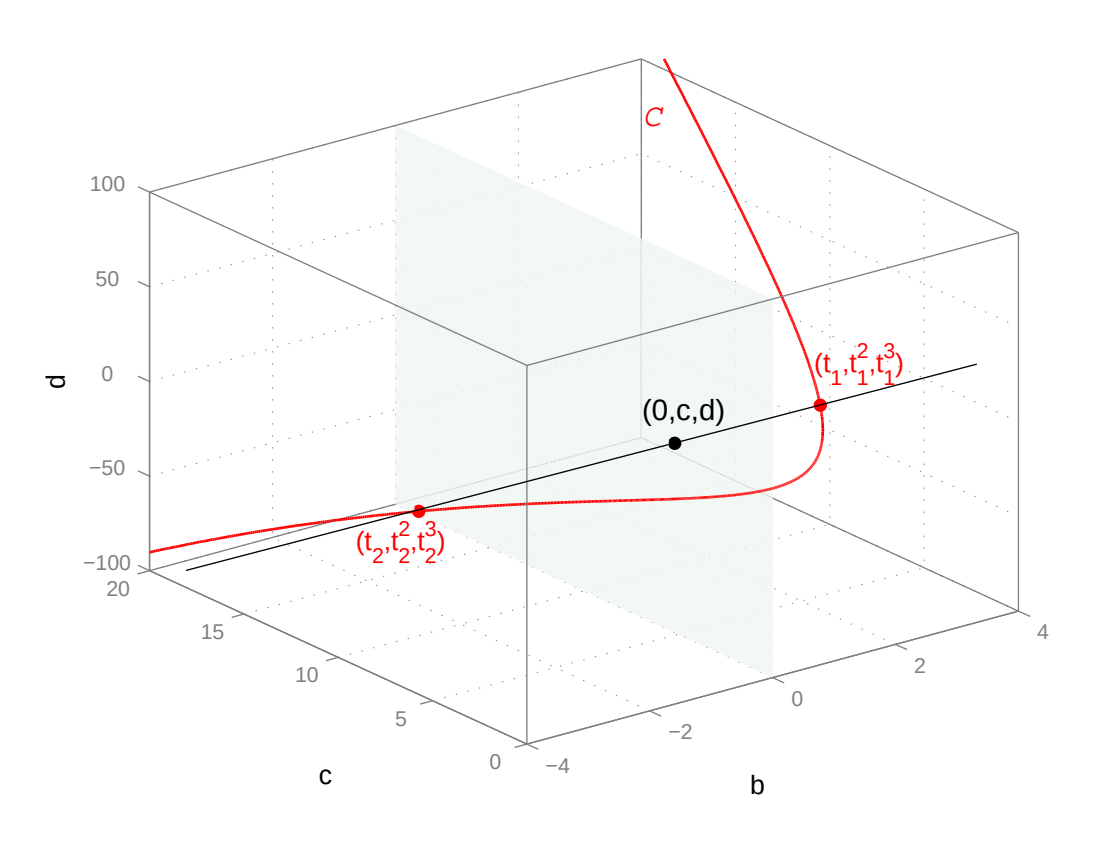

$b^2$-c=0
NO SOL. REALI
SOL. CONCORDI NEGATIVE
SOL. CONCORDI POSITIVE
SOL. DISCORDI (QUELLA NEGATIVA HA MODULO MAGGIORE)
SOL. DISCORDI (QUELLA POSITIVA HA MODULO MAGGIORE)
c
0
0
b

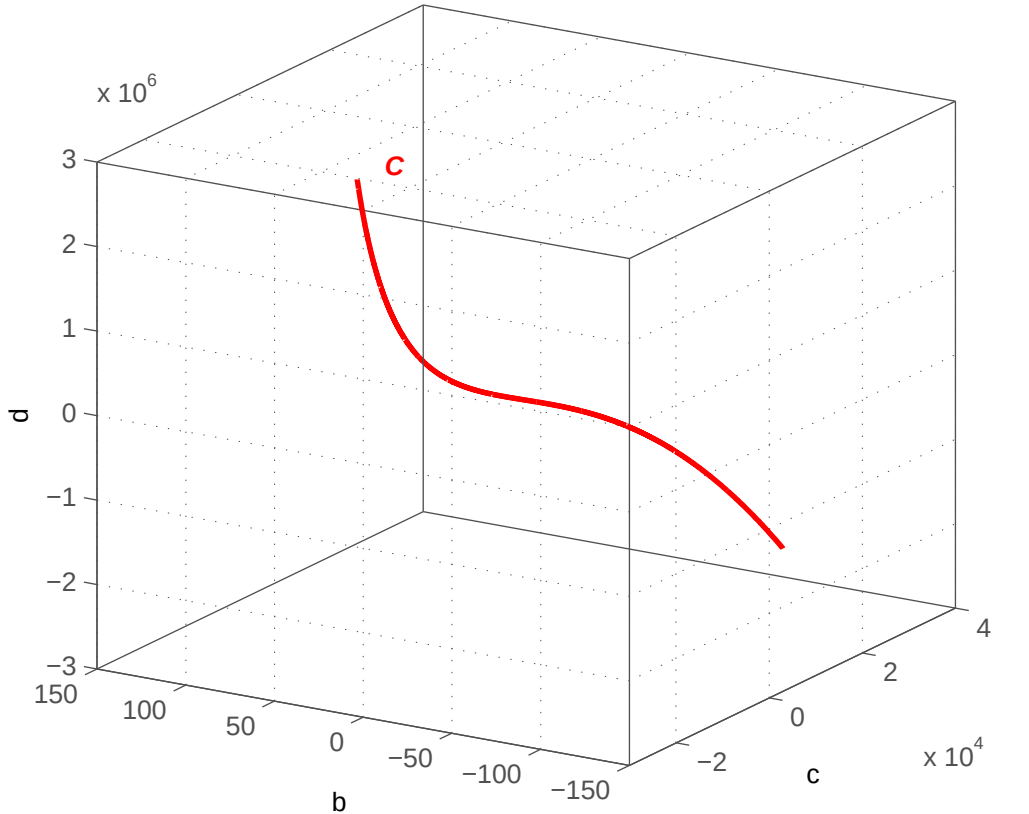

c
b
b^2−c=0
c=−(1/4)b+5/4
7
6
5
4
3
2
1
0
−1
−2
−3
−4
−8
−7
−6
−5
−4
−3
−2
−1
0
1
2
3
4
5
6
7

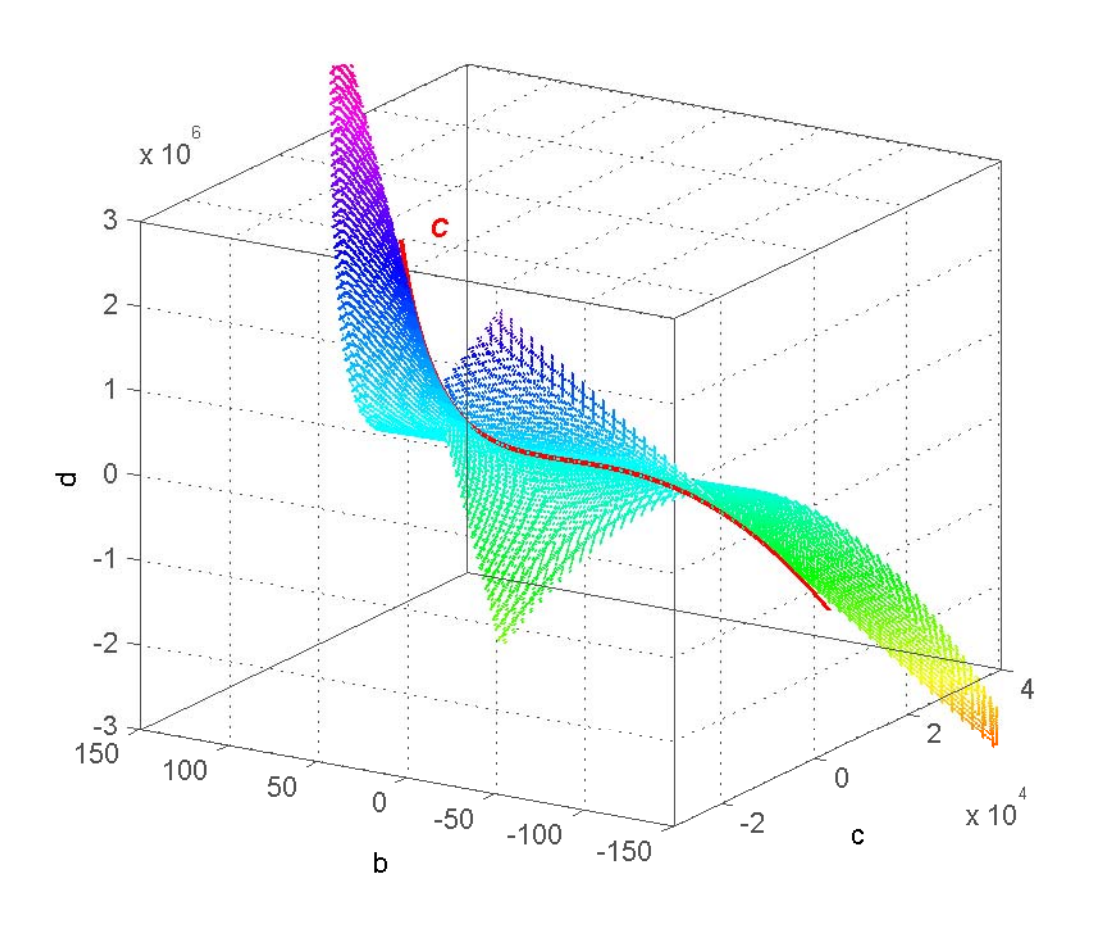

c
b
b^2−c=0
c=−(1/4)b+5/4
(1,1)
(5,0)
7
6
5
4
3
2
1
0
−1
−2
−3
−4
−8
−7
−6
−5
−4
−3
−2
−1
0
1
2
3
4
5
6
7

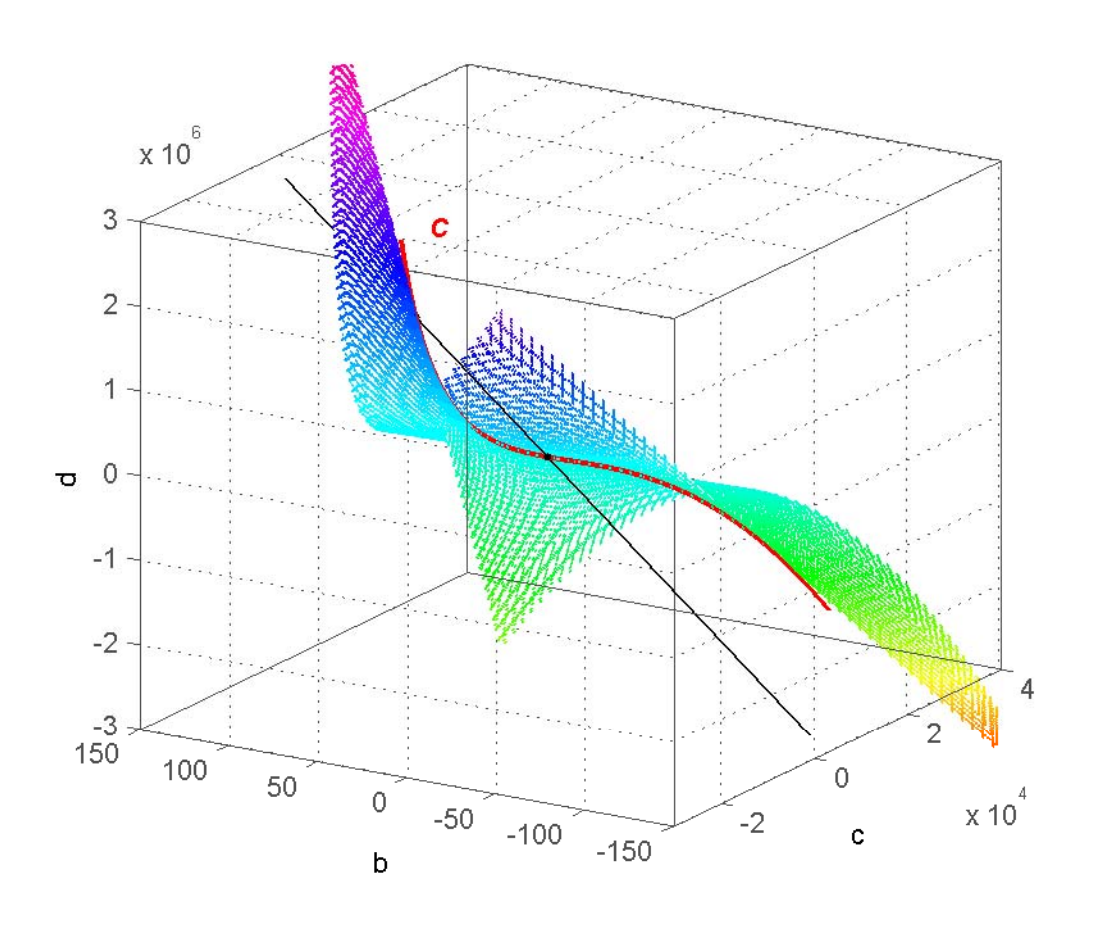

C
100
50
0
−50
−100
d
20
15
10
5
0
c
−4
−2
0
2
4
b

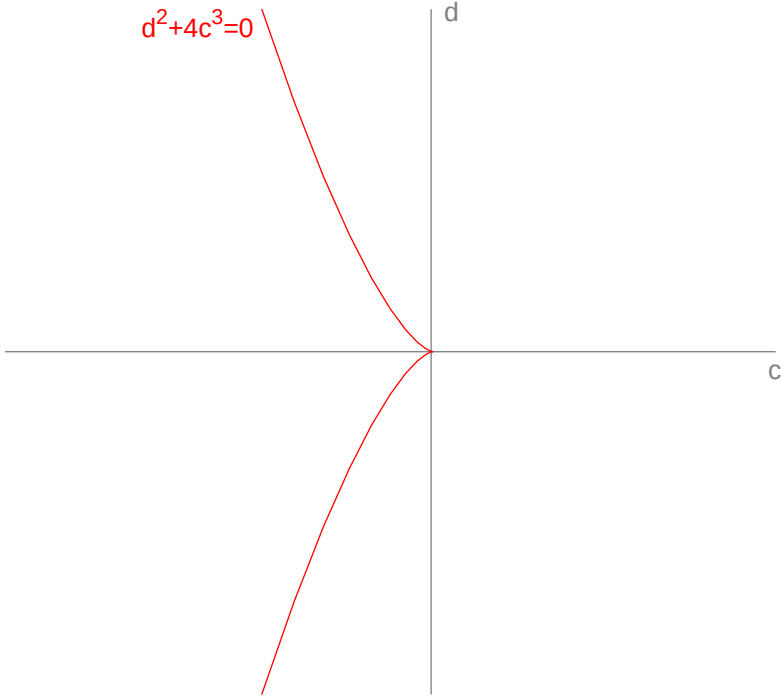

C
(0,c,d)
100
50
0
−50
−100
d
20
15
10
5
0
c
−4
−2
0
2
4
b

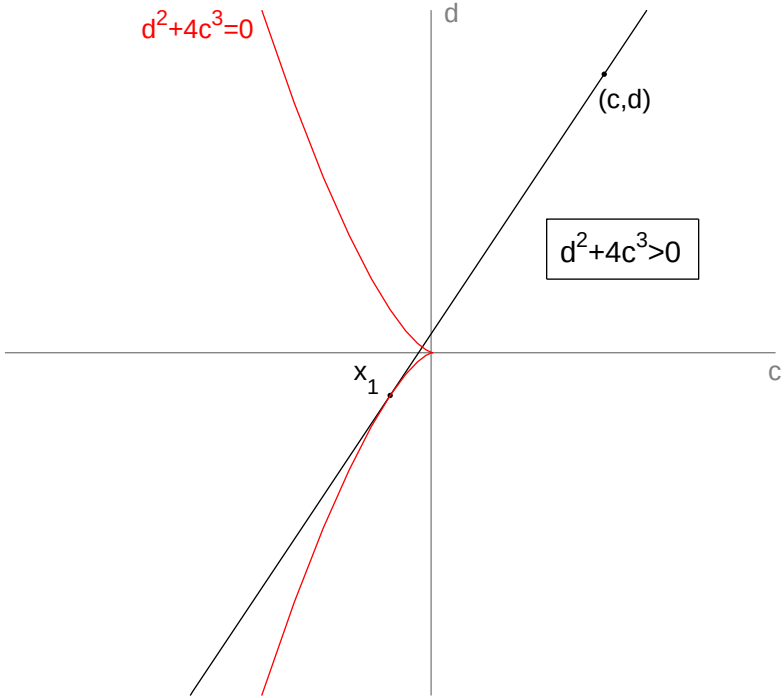

C
100
50
0
−50
−100
d
20
15
10
5
0
c
−4
−2
0
2
4
b
(0,c,d)
$(t_1,t_1^2,t_1^3)$
$(t_2,t_2^2,t_2^3)$

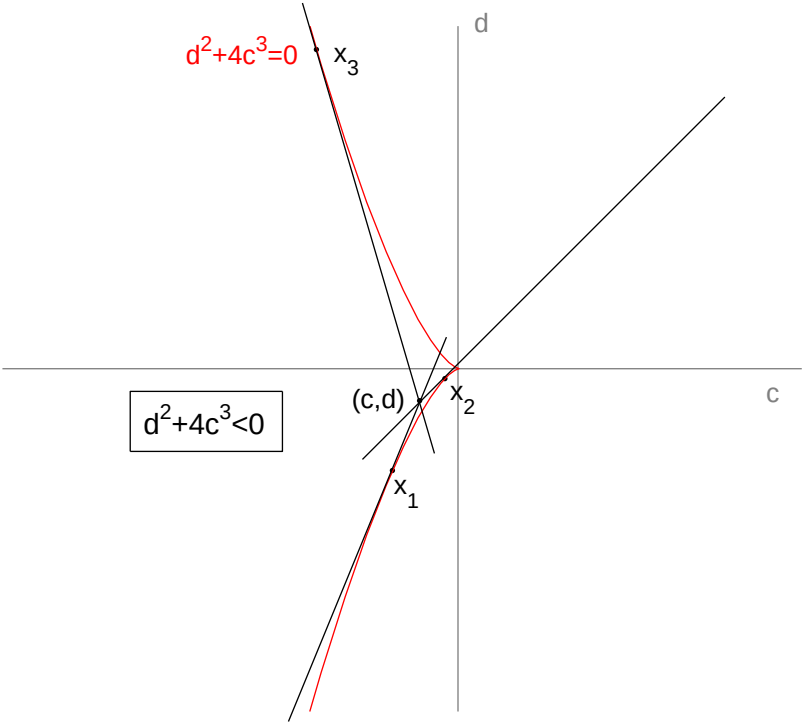

x 10^6
3
2
1
0
−1
−2
−3
d
C
150
100
50
0
−50
−100
−150
b
4
2
0
−2
x 10^4
c

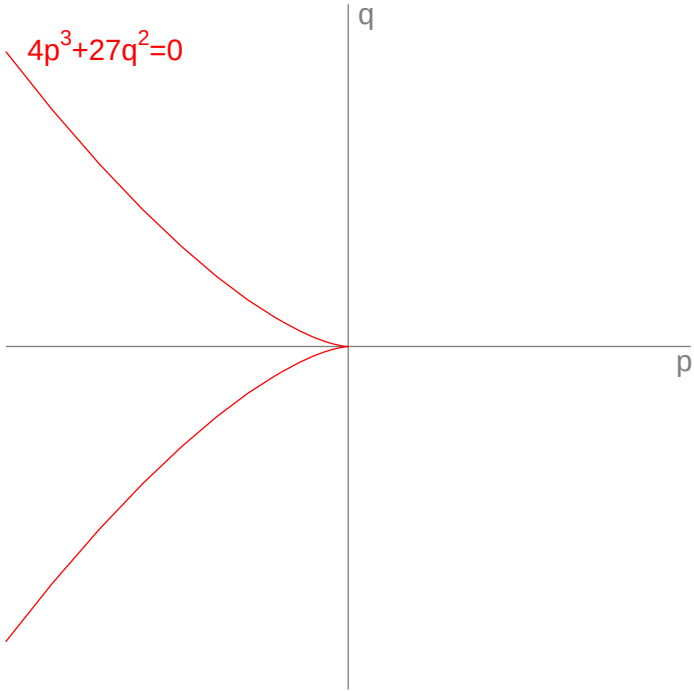

x 10^6
3
2
1
0
-1
-2
-3
d
c
150
100
50
0
-50
-100
-150
b
-2
0
2
4
x 10^4
c

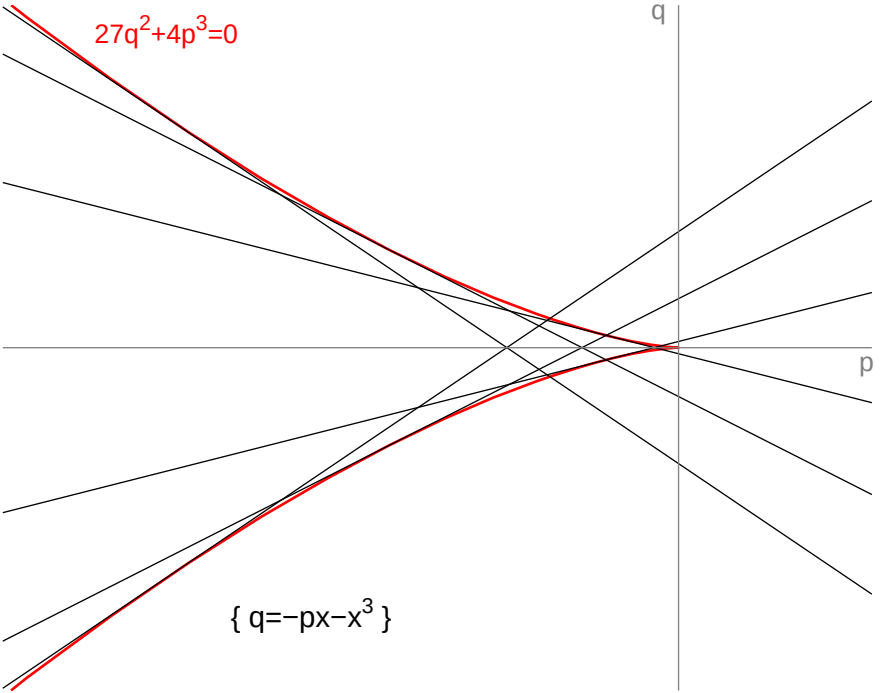

x 10^6
3
2
1
0
-1
-2
-3
d
c
150
100
50
0
-50
-100
-150
b
-2
0
2
4
x 10^4
c

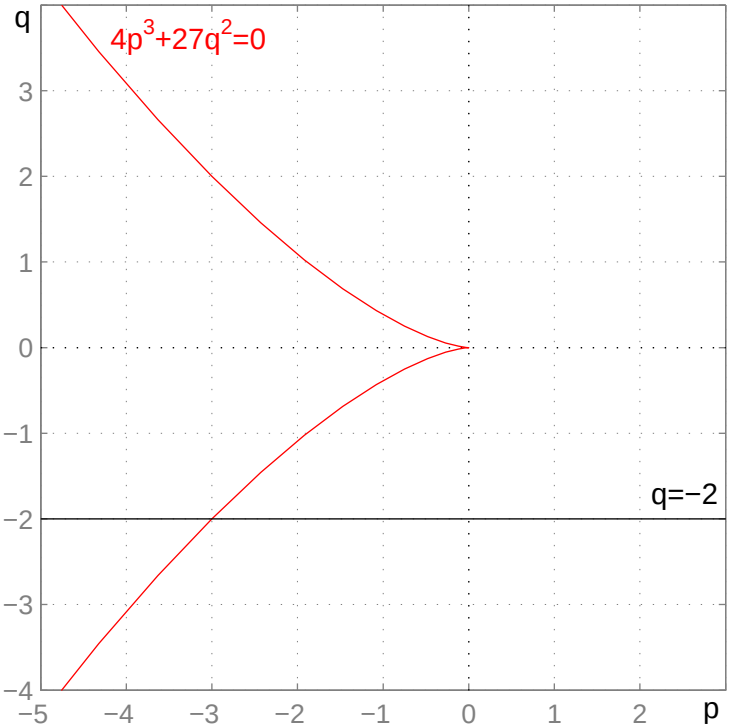

$d^2+4c^3=0$
d
c

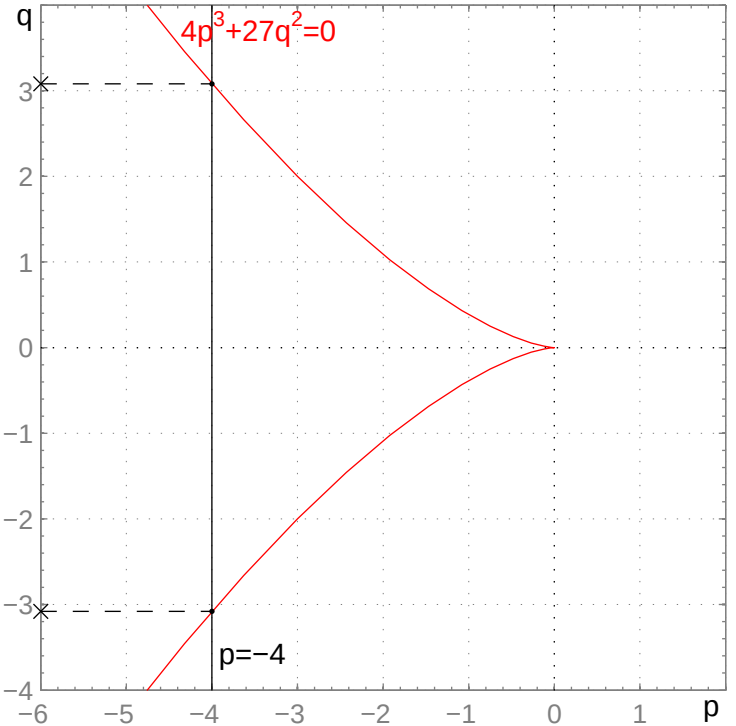

$d^2+4c^3=0$
d
(c,d)
$d^2+4c^3>0$
$x_1$
c

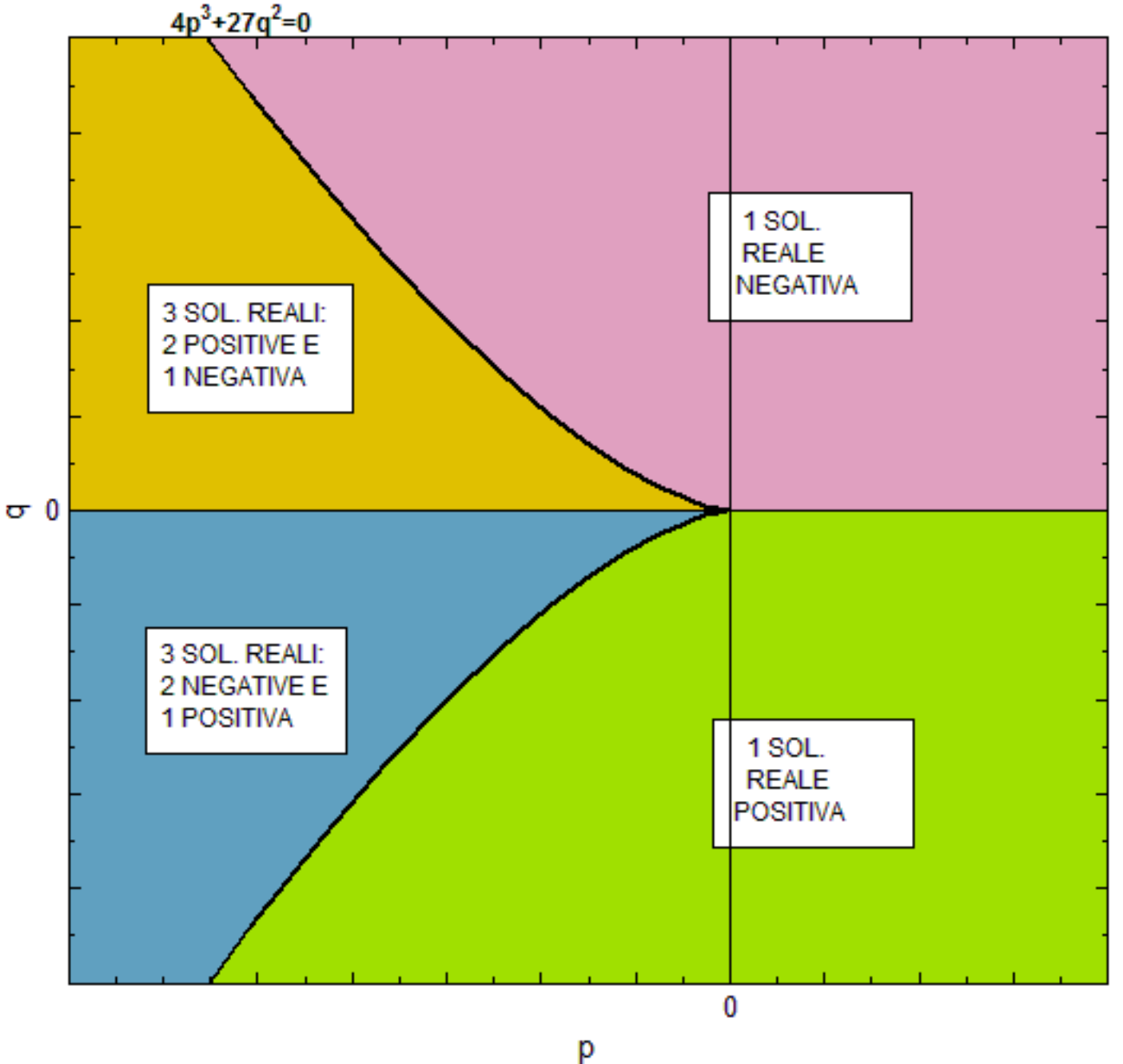

d
c
$d^2+4c^3=0$
$x_3$
$x_2$
$x_1$
(c,d)
$d^2+4c^3<0$

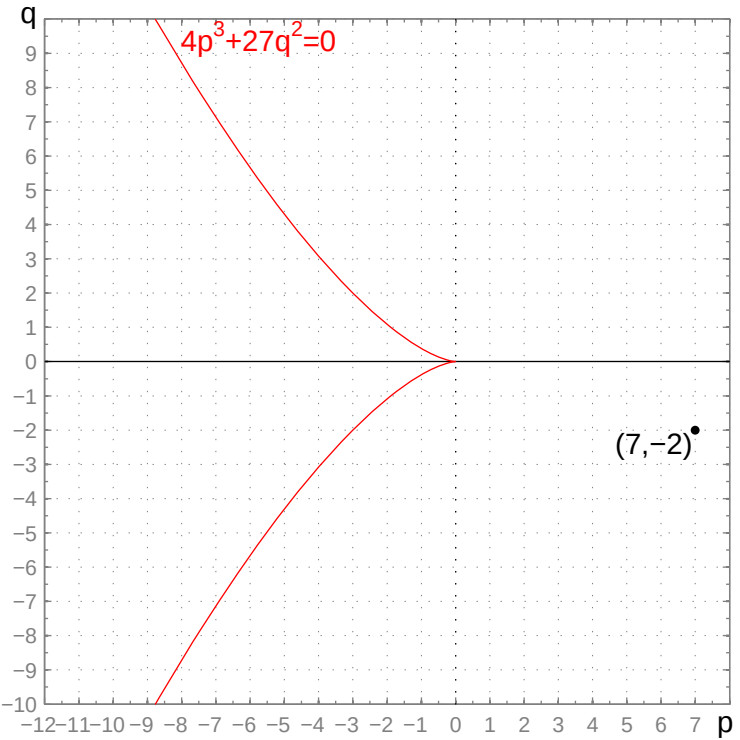

$4p^3+27q^2=0$
q
p

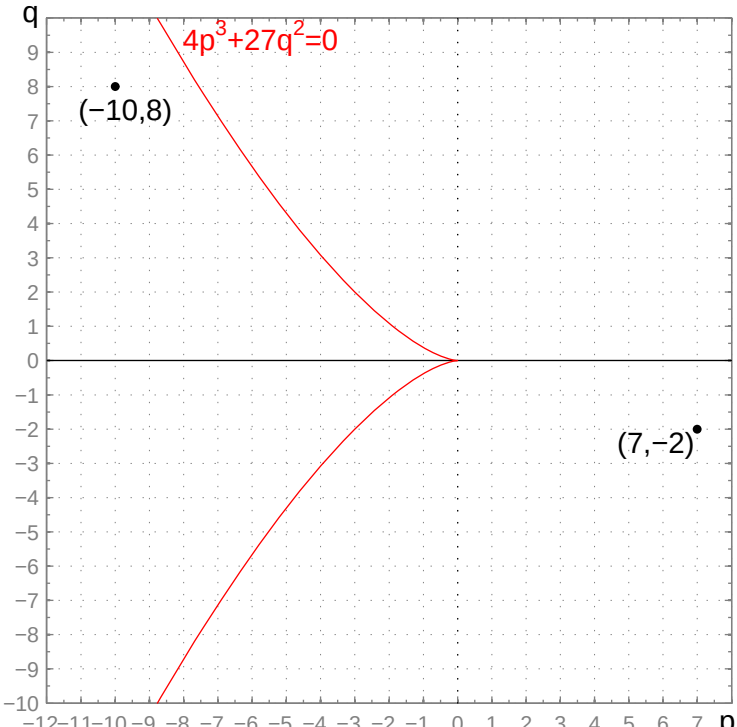

$27q^2+4p^3=0$
q
p
{ $q=-px-x^3$ }

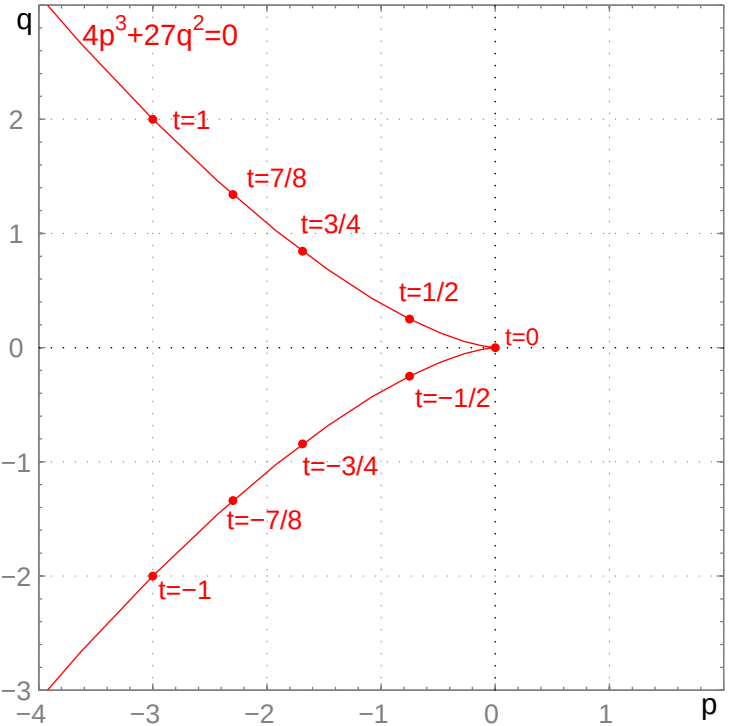

q
$4p^3+27q^2=0$
3
2
1
0
−1
−2
−3
−4
q=−2
−5
−4
−3
−2
−1
0
1
2
p

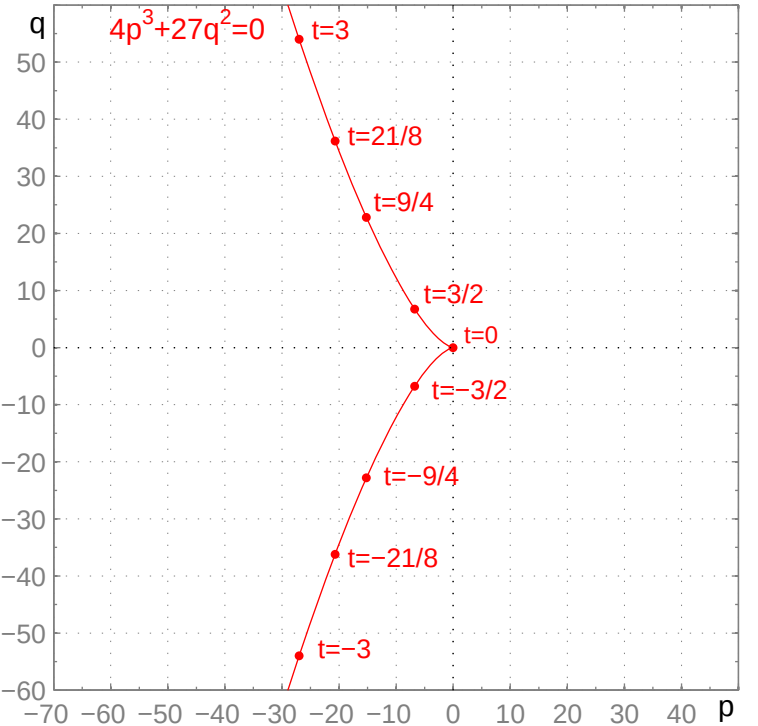

q
p
$4p^3+27q^2=0$
p=−4
3
2
1
0
−1
−2
−3
−4
−6
−5
−4
−3
−2
−1
0
1

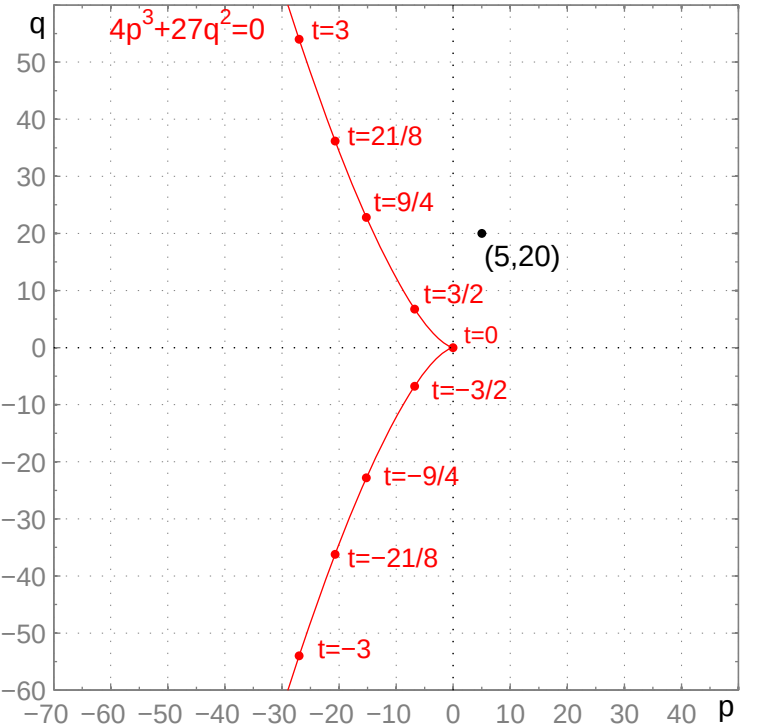

$4p^3+27q^2=0$
3 SOL. REALI:
2 POSITIVE E
1 NEGATIVA
1 SOL.
REALE
NEGATIVA
3 SOL. REALI:
2 NEGATIVE E
1 POSITIVA
1 SOL.
REALE
POSITIVA
q
0
0
p

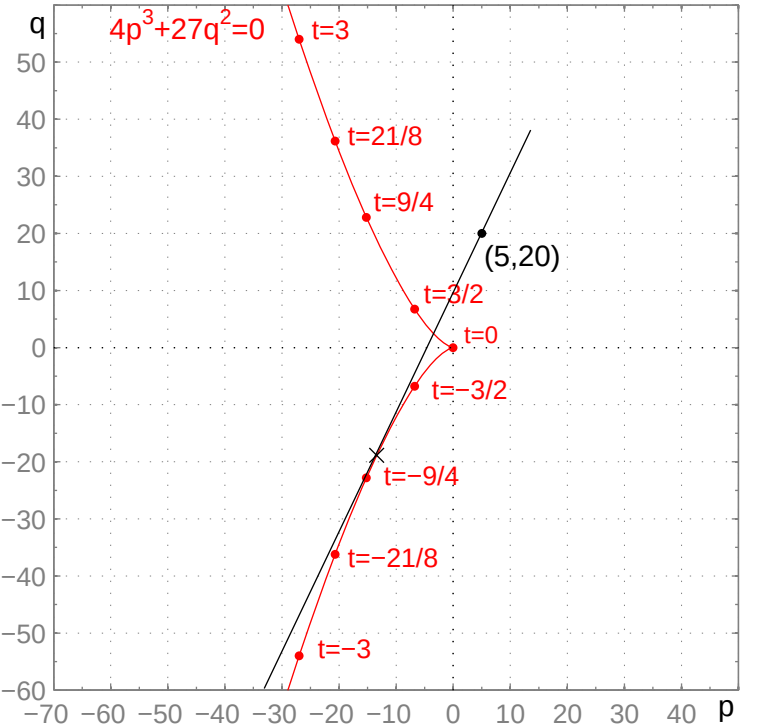

q
p
$4p^3+27q^2=0$
(7,−2)
9
8
7
6
5
4
3
2
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−9
−10
−12 −11 −10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7

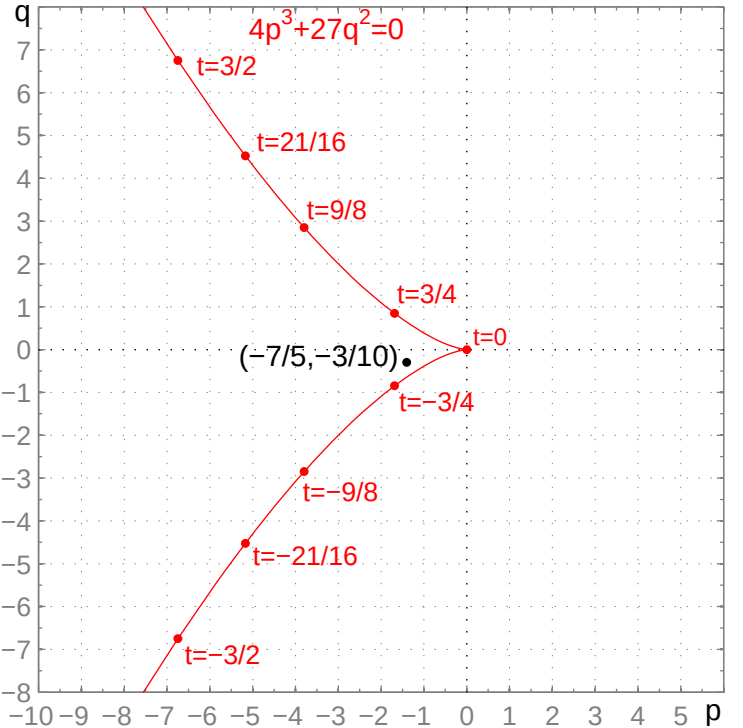

q
p
$4p^3+27q^2=0$
(−10,8)
(7,−2)
9
8
7
6
5
4
3
2
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−9
−10
−12 −11 −10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7

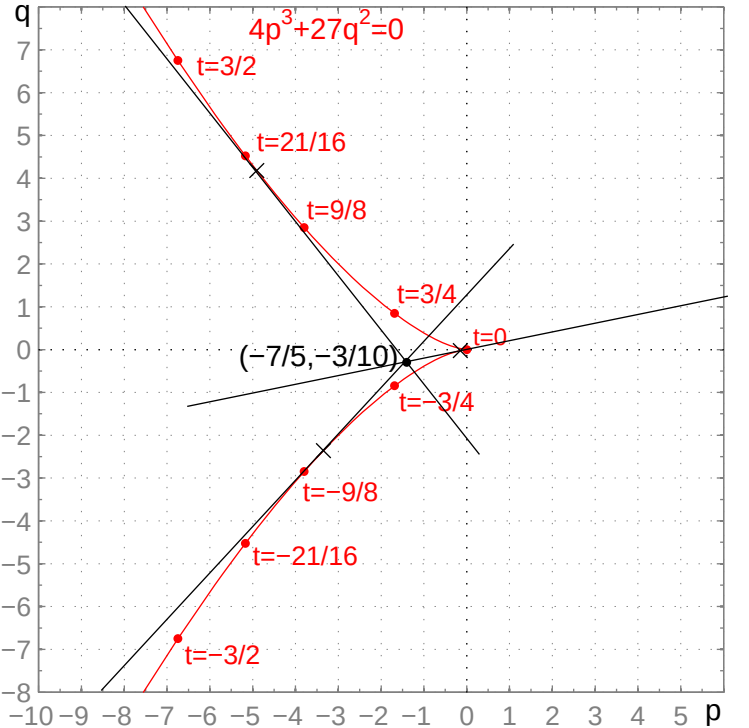

q
p
$4p^3+27q^2=0$
t=1
t=7/8
t=3/4
t=1/2
t=0
t=−1/2
t=−3/4
t=−7/8
t=−1
2
1
0
−1
−2
−3
−4
−3
−2
−1
0
1


q
p
$4p^3+27q^2=0$
t=3
t=21/8
t=9/4
t=3/2
t=0
t=−3/2
t=−9/4
t=−21/8
t=−3
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−60
−50
−40
−30
−20
−10
0
10
20
30
40


q
p
$4p^3+27q^2=0$
t=3
t=21/8
t=9/4
t=3/2
t=0
t=−3/2
t=−9/4
t=−21/8
t=−3
(5,20)
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−60
−50
−40
−30
−20
−10
0
10
20
30
40


q
p
4p^3+27q^2=0
t=3
t=21/8
t=9/4
t=3/2
t=0
t=−3/2
t=−9/4
t=−21/8
t=−3
(5,20)
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−60
−50
−40
−30
−20
−10
0
10
20
30
40


q
p
4p^3+27q^2=0
t=3/2
t=21/16
t=9/8
t=3/4
t=0
(−7/5,−3/10)
t=−3/4
t=−9/8
t=−21/16
t=−3/2
7
6
5
4
3
2
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5


q
p
4p^3+27q^2=0
t=3/2
t=21/16
t=9/8
t=3/4
t=0
(−7/5,−3/10)
t=−3/4
t=−9/8
t=−21/16
t=−3/2
7
6
5
4
3
2
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5