

pq-Formel:

$$x_{1,2} = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$

abc-Formel:

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Aufgaben

1 Löse mit der abc- oder pq-Formel.

(a) $x^2 + 6x + 5 = 0$

(e) $x^2 + 6x + 7 = 0$

(i) $z^2 - 13z - 48 = 0$

(b) $x^2 + 8x - 9 = 0$

(f) $x^2 - x - 20 = 0$

(j) $3z^2 - 4z - 4 = 0$

(c) $3x^2 - 4x - 4 = 0$

(g) $2x^2 - 11x - 6 = 0$

(k) $2z^2 + 9z + 7 = 0$

(d) $2x^2 - 5x - 42 = 0$

(h) $x^2 - x - 56 = 0$

(l) $3z^2 - 11z + 10 = 0$

2 Umgestellte quadratische Gleichungen

(a) $-x^2 + x + 6 = 0$

(d) $4x - 1 - x^2 = 0$

(g) $84 - 3x^2 - 9x = 0$

(b) $2 + x - 15x^2 = 0$

(e) $10x - 6 - 3x^2 = 0$

(c) $4 - 4x^2 + 15x = 0$

(f) $8x - x^2 - 11 = 0$

(h) $11x - 10 - 3x^2 = 0$

3 Quadratische Gleichungen mit Dezimalzahlen

(a) $x^2 - 1,8x + 0,32 = 0$

(d) $0,2x^2 - 0,1x + 0,012 = 0$

(g) $v^2 + 1,2v = 0,45$

(b) $x^2 - 0,6x + 0,05 = 0$

(e) $0,5z^2 + 0,2z + 0,52 = 0$

(h) $2w^2 = 0,18 - 1,6w$

(c) $x^2 + 2,4x - 0,81 = 0$

(f) $1,5u^2 - 1,2u + 0,24 = 0$

(i) $1,245 = 0,04t + t^2$

4 Multipliziere zuerst die Gleichung mit dem Hauptnenner der Brüche und löse dann mit der abc-Formel.

(a) $x^2 + \frac{2}{5}x - \frac{3}{5} = 0$

(e) $x^2 + \frac{1}{20} = \frac{3}{5}x$

(i) $\frac{22}{3}x = x^2 + \frac{35}{3}$

(b) $x^2 - \frac{14}{3}x + \frac{16}{3} = 0$

(f) $-\frac{1}{2}x^2 = 2x + \frac{15}{8}$

(j) $\frac{4}{15}x^2 = \frac{4}{5}x + \frac{3}{5}$

(c) $\frac{1}{5}x^2 - \frac{2}{9}x + \frac{1}{5} = 0$

(g) $\frac{2}{9}u^2 - 42 = \frac{5}{3}u$

(k) $\frac{3}{20}x^2 + \frac{3}{10} = \frac{1}{2}x$

(d) $\frac{1}{3}x^2 + x - \frac{4}{3} = 0$

(h) $-\frac{1}{6}z^2 + \frac{1}{2}z = -\frac{20}{3}$

(l) $3x = \frac{7}{11}x^2 + \frac{36}{11}$

5 Löse durch Ausklammern.

(a) $x^3 + 8x^2 - 9x = 0$

(d) $3u^3 - 4u^2 - 4u = 0$

(b) $x^3 - x^2 - 56x = 0$

(e) $4z^3 + 9z^2 + 2z = 0$

(c) $2x^3 - 5x^2 - 42x = 0$

(f) $18x^4 + 39x^3 - 7x^2 = 0$

6 Löse durch Ausklammern.

(a) $(x^2 + 2x + 1) + 3x(x + 1)^2 = 0$

(b) $(x^2 - 2x + 1) + 7x(x - 1)^2 = 0$

(c) $(16x^2 + 8x + 1) + 5x(4x + 1)^2 = 0$

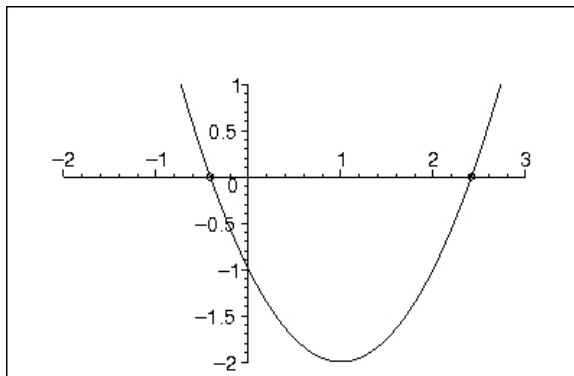
(d) $(9x^2 - 6x + 1) + 2x(3x - 1)^2 = 0$

(e) $(25x^2 + 30x + 9) + (5 - 8x)(5x + 3)^2 = 0$

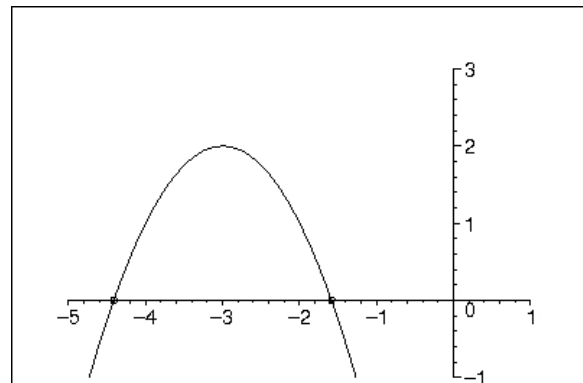
(f) $(x + 2)(9x - 4)^2 + (81x^2 - 72x + 16) = 0$

7 Schnittpunktberechnungen

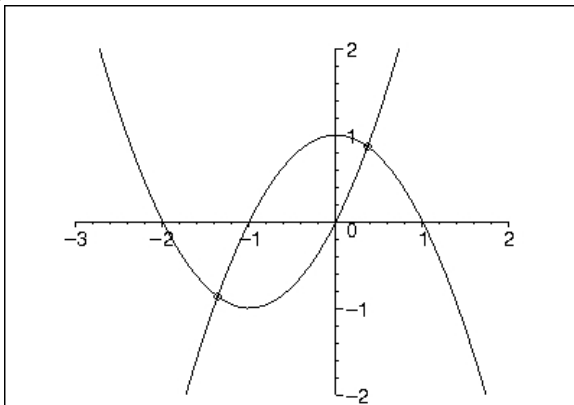
Alle Parabeln sind mit der Normalparabelschablone gezeichnet. Gib den jeweiligen Scheitelpunkt S an und berechne die Koordinaten der eingezeichneten Schnittpunkte.



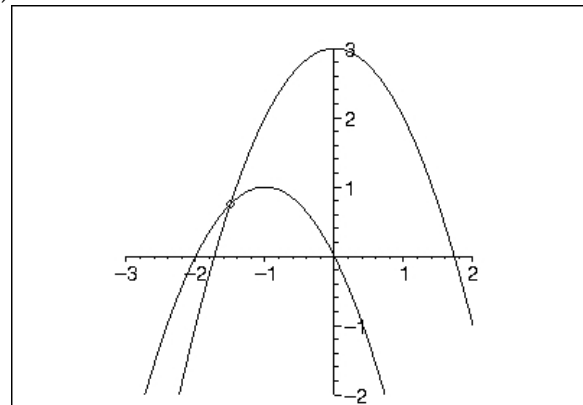
(a)



(b)



(c)



(d)

Lösungen

1 Lösung Aufgabe 1

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|---|--|--|
| (a) $\mathbb{L} = \{-5; -1\}$ | $\sqrt{2}$ | (i) $\mathbb{L} = \{-3; 16\}$ |
| (b) $\mathbb{L} = \{-9; 1\}$ | $\approx \{-4,41421; -1,58579\}$ | (j) $\mathbb{L} = \{-\frac{2}{3}; 2\}$ |
| (c) $\mathbb{L} = \{-\frac{2}{3}; 2\}$ | (f) $\mathbb{L} = \{-4; 5\}$ | (k) $\mathbb{L} = \{-3,5; -1\}$ |
| (d) $\mathbb{L} = \{-3,5; 6\}$ | (g) $\mathbb{L} = \{-\frac{1}{2}; 6\}$ | (l) $\mathbb{L} = \{\frac{5}{3}; 2\}$ |
| (e) $\mathbb{L} = \{-3 - \sqrt{2}; -3 + \sqrt{2}\}$ | (h) $\mathbb{L} = \{-7; 8\}$ | |

2 Lösung Aufgabe 2

- | | | |
|--|---|---|
| (a) $\mathbb{L} = \{-2; 3\}$ | (d) $\mathbb{L} = \{2 - \sqrt{3}; 2 + \sqrt{3}\}$ | (f) $\mathbb{L} = \{4 - \sqrt{5}; 4 + \sqrt{5}\}$ |
| (b) $\mathbb{L} = \{-\frac{1}{3}; \frac{2}{5}\}$ | $\approx \{0,26795; 3,73205\}$ | $\approx \{1,76393; 6,23607\}$ |
| (c) $\mathbb{L} = \{-\frac{1}{4}; 4\}$ | (e) $\mathbb{L} = \{\frac{5}{3} - \frac{\sqrt{7}}{3}; \frac{5}{3} + \frac{\sqrt{7}}{3}\}$ | (g) $\mathbb{L} = \{-7; 4\}$ |
| | $\approx \{0,78475; 2,54858\}$ | (h) $\mathbb{L} = \{\frac{5}{3}; 2\}$ |

3 Lösung Aufgabe 3

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|----------------------------------|---------------------------------|--|
| (a) $\mathbb{L} = \{0,2; 1,6\}$ | (d) $\mathbb{L} = \{0,2; 0,3\}$ | (g) $\mathbb{L} = \{-1,5; 0,3\}$ |
| (b) $\mathbb{L} = \{0,1; 0,5\}$ | (e) $\mathbb{L} = \{\}$ | (h) $\mathbb{L} = \{-0,9; 0,1\}$ |
| (c) $\mathbb{L} = \{-2,7; 0,3\}$ | (f) $\mathbb{L} = \{0,4\}$ | (i) $\mathbb{L} \approx \{-1,13597; 1,09597\}$ |

4 Lösung Aufgabe 4

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|---------------------------------------|-----------------------------------|--|
| (a) $\mathbb{L} = \{-1; 0,6\}$ | (e) $\mathbb{L} = \{0,1; 0,5\}$ | (i) $\mathbb{L} = \{\frac{7}{3}; 5\}$ |
| (b) $\mathbb{L} = \{\frac{8}{3}; 2\}$ | (f) $\mathbb{L} = \{-2,5; -1,5\}$ | (j) $\mathbb{L} \approx \{-0,62132; 3,62132\}$ |
| (c) $\mathbb{L} = \{\}$ | (g) $\mathbb{L} = \{-10,5; 18\}$ | (k) $\mathbb{L} \approx \{0,78475; 2,54858\}$ |
| (d) $\mathbb{L} = \{-4; 1\}$ | (h) $\mathbb{L} = \{-5; 8\}$ | (l) $\mathbb{L} = \{\frac{12}{7}; 3\}$ |

5 Lösung Aufgabe 5

Beispiel (a):

$$\begin{aligned} x^3 + 8x^2 - 9x &= 0 \\ x \cdot (x^2 + 8x - 9) &= 0 \end{aligned}$$

1. Fall:

$$x_1 = 0$$

2. Fall:

$$\begin{aligned}x^2 + 8x - 9 &= 0 \\x_2 &= -9 \\x_3 &= 1\end{aligned}$$

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|---------------------------------|---|---|
| (a) $\mathbb{L} = \{-9; 0; 1\}$ | (c) $\mathbb{L} = \{-3,5; 0; 6\}$ | (e) $\mathbb{L} = \{-2; -0,25; 0\}$ |
| (b) $\mathbb{L} = \{-7; 0; 8\}$ | (d) $\mathbb{L} = \{-\frac{2}{3}; 0; 2\}$ | (f) $\mathbb{L} = \{-\frac{7}{3}; 0; \frac{1}{6}\}$ |

6 Lösung Aufgabe 6

Beispiel (a):

$$\begin{aligned}(x^2 + 2x + 1) + 3x(x + 1)^2 &= 0 \\(x + 1)^2 + 3x(x + 1)^2 &= 0 \\(x + 1)^2(1 + 3x) &= 0\end{aligned}$$

1. Fall:

$$\begin{aligned}(x + 1)^2 &= 0 \\x_1 &= -1\end{aligned}$$

2. Fall:

$$\begin{aligned}1 + 3x &= 0 \\x_2 &= -\frac{1}{3}\end{aligned}$$

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|---|--|--|
| (a) $\mathbb{L} = \{-1; -\frac{1}{3}\}$ | (c) $\mathbb{L} = \{-0,25; -0,2\}$ | (e) $\mathbb{L} = \{-0,6; 0,75\}$ |
| (b) $\mathbb{L} = \{-\frac{1}{7}; 1\}$ | (d) $\mathbb{L} = \{-0,5; \frac{1}{3}\}$ | (f) $\mathbb{L} = \{-3; \frac{4}{9}\}$ |

7 Lösung Aufgabe 7

- (a) $S(1|-2), P_1(1 - \sqrt{2}|0) \approx P_1(-0,41421|0), P_2(1 + \sqrt{2}|0) \approx P_2(2,41421|0)$
- (b) $S(-3|2), P_1(-3 - \sqrt{2}|0) \approx P_1(-4,41421|0), P_2(-3 + \sqrt{2}|0) \approx P_2(-1,58579|0)$
- (c) $S_1(-1|-1), S_2(0|1), P_1\left(-\frac{1}{2} - \frac{\sqrt{3}}{2} \mid -\frac{\sqrt{3}}{2}\right) \approx P_1(-1,36603|-0,86603),$
 $P_2\left(-\frac{1}{2} + \frac{\sqrt{3}}{2} \mid \frac{\sqrt{3}}{2}\right) \approx P_2(0,36603|0,86603)$
- (d) $S_1(-1|1), S_2(0|3), P(-1,5|0,75)$