

Quadratische Funktionen: ABC-Formel anwenden

Aufgabe:

Gegeben ist eine quadratische Funktion in Normalform.
Bestimme die Nullstellen mit Hilfe der ABC-Formel.

a) $f(x) = 3x^2 + 3x - 18$

b) $f(x) = 2x^2 - 10x + 12$

c) $f(x) = -2x^2 - 2x + 12$

d) $f(x) = 2x^2 - 12x + 18$

e) $f(x) = 4x^2 - 8x - 12$

f) $f(x) = 3x^2 - 6x + 3$

g) $f(x) = -3x^2 + 15x - 12$

h) $f(x) = 2x^2 - 10x + 12$

i) $f(x) = -4x^2 + 32x - 64$

j) $f(x) = 1x^2 - 3x + 2$

k) $f(x) = -2x^2 + 2x + 12$

l) $f(x) = -4x^2 + 16$

m) $f(x) = -2x^2 + 12x - 18$

n) $f(x) = -3x^2 + 9x - 6$

o) $f(x) = -2x^2 + 18$

p) $f(x) = -1x^2 + 2x + 8$

Ein Erklärvideo zum Thema findest du unter dem folgenden Link.



Lösung:

- a) ABC-Formel: $A = 3, B = 3, C = -18$
 $x_{1/2} = \frac{-3 \pm \sqrt{3^2 - 4 \cdot 3 \cdot (-18)}}{2 \cdot 3}$
 $= \frac{-3 \pm \sqrt{9 + 216}}{6}$
 $= \frac{-3 \pm \sqrt{225}}{6} = \frac{-3 \pm 15}{6}$
 $x_1 = \frac{-3 + 15}{6} = 12 : 6 = 2$
 $x_2 = \frac{-3 - 15}{6} = -18 : 6 = -3$
- b) ABC-Formel: $A = 2, B = -10, C = 12$
 $x_{1/2} = \frac{10 \pm \sqrt{(-10)^2 - 4 \cdot 2 \cdot 12}}{2 \cdot 2}$
 $= \frac{10 \pm \sqrt{100 - 96}}{4}$
 $= \frac{10 \pm \sqrt{4}}{4} = \frac{10 \pm 2}{4}$
 $x_1 = \frac{10 + 2}{4} = 12 : 4 = 3$
 $x_2 = \frac{10 - 2}{4} = 8 : 4 = 2$
- c) ABC-Formel: $A = -2, B = -2, C = 12$
 $x_{1/2} = \frac{2 \pm \sqrt{(-2)^2 - 4 \cdot (-2) \cdot 12}}{2 \cdot (-2)}$
 $= \frac{2 \pm \sqrt{4 + 96}}{-4}$
 $= \frac{2 \pm \sqrt{100}}{-4} = \frac{2 \pm 10}{-4}$
 $x_1 = \frac{2 + 10}{-4} = 12 : (-4) = -3$
 $x_2 = \frac{2 - 10}{-4} = -8 : (-4) = 2$
- d) ABC-Formel: $A = 2, B = -12, C = 18$
 $x_{1/2} = \frac{12 \pm \sqrt{(-12)^2 - 4 \cdot 2 \cdot 18}}{2 \cdot 2}$
 $= \frac{12 \pm \sqrt{144 - 144}}{4}$
 $= \frac{12 \pm \sqrt{0}}{4} = \frac{12 \pm 0}{4}$
 $x_1 = \frac{12 + 0}{4} = 12 : 4 = 3$
 $x_2 = \frac{12 - 0}{4} = 12 : 4 = 3$
- e) ABC-Formel: $A = 4, B = -8, C = -12$
 $x_{1/2} = \frac{8 \pm \sqrt{(-8)^2 - 4 \cdot 4 \cdot (-12)}}{2 \cdot 4}$
 $= \frac{8 \pm \sqrt{64 + 192}}{8}$
 $= \frac{8 \pm \sqrt{256}}{8} = \frac{8 \pm 16}{8}$
 $x_1 = \frac{8 + 16}{8} = 24 : 8 = 3$
 $x_2 = \frac{8 - 16}{8} = -8 : 8 = -1$
- f) ABC-Formel: $A = 3, B = -6, C = 3$
 $x_{1/2} = \frac{6 \pm \sqrt{(-6)^2 - 4 \cdot 3 \cdot 3}}{2 \cdot 3}$
 $= \frac{6 \pm \sqrt{36 - 36}}{6}$
 $= \frac{6 \pm \sqrt{0}}{6} = \frac{6 \pm 0}{6}$
 $x_1 = \frac{6 + 0}{6} = 6 : 6 = 1$
 $x_2 = \frac{6 - 0}{6} = 6 : 6 = 1$
- g) ABC-Formel: $A = -3, B = 15, C = -12$
 $x_{1/2} = \frac{-15 \pm \sqrt{15^2 - 4 \cdot (-3) \cdot (-12)}}{2 \cdot (-3)}$
 $= \frac{-15 \pm \sqrt{225 - 144}}{-6}$
 $= \frac{-15 \pm \sqrt{81}}{-6} = \frac{-15 \pm 9}{-6}$
 $x_1 = \frac{-15 + 9}{-6} = -6 : (-6) = 1$
 $x_2 = \frac{-15 - 9}{-6} = -24 : (-6) = 4$
- h) ABC-Formel: $A = 2, B = -10, C = 12$
 $x_{1/2} = \frac{10 \pm \sqrt{(-10)^2 - 4 \cdot 2 \cdot 12}}{2 \cdot 2}$
 $= \frac{10 \pm \sqrt{100 - 96}}{4}$
 $= \frac{10 \pm \sqrt{4}}{4} = \frac{10 \pm 2}{4}$
 $x_1 = \frac{10 + 2}{4} = 12 : 4 = 3$
 $x_2 = \frac{10 - 2}{4} = 8 : 4 = 2$
- i) ABC-Formel: $A = -4, B = 32, C = -64$
 $x_{1/2} = \frac{-32 \pm \sqrt{32^2 - 4 \cdot (-4) \cdot (-64)}}{2 \cdot (-4)}$
 $= \frac{-32 \pm \sqrt{1024 - 1024}}{-8}$
 $= \frac{-32 \pm \sqrt{0}}{-8} = \frac{-32 \pm 0}{-8}$
 $x_1 = \frac{-32 + 0}{-8} = -32 : (-8) = 4$
 $x_2 = \frac{-32 - 0}{-8} = -32 : (-8) = 4$
- j) ABC-Formel: $A = 1, B = -3, C = 2$
 $x_{1/2} = \frac{3 \pm \sqrt{(-3)^2 - 4 \cdot 1 \cdot 2}}{2 \cdot 1}$
 $= \frac{3 \pm \sqrt{9 - 8}}{2}$
 $= \frac{3 \pm \sqrt{1}}{2} = \frac{3 \pm 1}{2}$
 $x_1 = \frac{3 + 1}{2} = 4 : 2 = 2$
 $x_2 = \frac{3 - 1}{2} = 2 : 2 = 1$
- k) ABC-Formel: $A = -2, B = 2, C = 12$
 $x_{1/2} = \frac{-2 \pm \sqrt{2^2 - 4 \cdot (-2) \cdot 12}}{2 \cdot (-2)}$
 $= \frac{-2 \pm \sqrt{4 + 96}}{-4}$
 $= \frac{-2 \pm \sqrt{100}}{-4} = \frac{-2 \pm 10}{-4}$
 $x_1 = \frac{-2 + 10}{-4} = 8 : (-4) = -2$
 $x_2 = \frac{-2 - 10}{-4} = -12 : (-4) = 3$
- l) ABC-Formel: $A = -4, B = 0, C = 16$
 $x_{1/2} = \frac{0 \pm \sqrt{0^2 - 4 \cdot (-4) \cdot 16}}{2 \cdot (-4)}$
 $= \frac{0 \pm \sqrt{0 + 256}}{-8}$
 $= \frac{0 \pm \sqrt{256}}{-8} = \frac{0 \pm 16}{-8}$
 $x_1 = \frac{0 + 16}{-8} = 16 : (-8) = -2$
 $x_2 = \frac{0 - 16}{-8} = -16 : (-8) = 2$
- m) ABC-Formel: $A = -2, B = 12, C = -18$
 $x_{1/2} = \frac{-12 \pm \sqrt{12^2 - 4 \cdot (-2) \cdot (-18)}}{2 \cdot (-2)}$
 $= \frac{-12 \pm \sqrt{144 - 144}}{-4}$
 $= \frac{-12 \pm \sqrt{0}}{-4} = \frac{-12 \pm 0}{-4}$
 $x_1 = \frac{-12 + 0}{-4} = -12 : (-4) = 3$
 $x_2 = \frac{-12 - 0}{-4} = -12 : (-4) = 3$
- n) ABC-Formel: $A = -3, B = 9, C = -6$
 $x_{1/2} = \frac{-9 \pm \sqrt{9^2 - 4 \cdot (-3) \cdot (-6)}}{2 \cdot (-3)}$
 $= \frac{-9 \pm \sqrt{81 - 72}}{-6}$
 $= \frac{-9 \pm \sqrt{9}}{-6} = \frac{-9 \pm 3}{-6}$
 $x_1 = \frac{-9 + 3}{-6} = -6 : (-6) = 1$
 $x_2 = \frac{-9 - 3}{-6} = -12 : (-6) = 2$
- o) ABC-Formel: $A = -2, B = 0, C = 18$
 $x_{1/2} = \frac{0 \pm \sqrt{0^2 - 4 \cdot (-2) \cdot 18}}{2 \cdot (-2)}$
 $= \frac{0 \pm \sqrt{0 + 144}}{-4}$
 $= \frac{0 \pm \sqrt{144}}{-4} = \frac{0 \pm 12}{-4}$
 $x_1 = \frac{0 + 12}{-4} = 12 : (-4) = -3$
 $x_2 = \frac{0 - 12}{-4} = -12 : (-4) = 3$
- p) ABC-Formel: $A = -1, B = 2, C = 8$
 $x_{1/2} = \frac{-2 \pm \sqrt{2^2 - 4 \cdot (-1) \cdot 8}}{2 \cdot (-1)}$
 $= \frac{-2 \pm \sqrt{4 + 32}}{-2}$
 $= \frac{-2 \pm \sqrt{36}}{-2} = \frac{-2 \pm 6}{-2}$
 $x_1 = \frac{-2 + 6}{-2} = 4 : (-2) = -2$
 $x_2 = \frac{-2 - 6}{-2} = -8 : (-2) = 4$