

2. Gleichungen und Funktionen 2. Grades

13. a. $\frac{1}{5}x^2 + \frac{1}{4} = \frac{1}{3}x^2 \quad | -\frac{1}{5}x^2$
 $\frac{1}{4} = \frac{2}{15}x^2$

$$x^2 = \frac{15}{8} \Rightarrow \underline{\underline{x_{1/2} = \pm 1.37}}$$

b. $x^2 - 64 = 8 - x^2$

$$2x^2 = 72$$

$$x^2 = 36 \Rightarrow \underline{\underline{x_{1/2} = \pm 6}}$$

c. $x - 5 = \pm 4 \Rightarrow \underline{\underline{x_1 = 9, x_2 = 1}}$

d. $x - 6 = \pm \sqrt{8} \Rightarrow \underline{\underline{x_1 = 8,88, x_2 = 3,12}}$

e. $(x-6)^2 = 8 \rightarrow$ siehe d.)

f. Faktoren = 0 setzen:

$$5x - 2 = 0 \quad \text{oder} \quad 7 - 3x = 0$$

$$\underline{\underline{x_1 = \frac{2}{5}}}$$

$$\underline{\underline{x_2 = \frac{7}{3}}}$$

g. analog f: $\frac{1}{3}x - 12 = 0$ oder $\frac{1}{4}x - 16 = 0$ oder

$$\underline{\underline{x_1 = 36}}$$

$$\underline{\underline{x_2 = 64}}$$

$$\underline{\underline{x_3 = 0}}$$

14. Substitution: $z = x^2$

a. $z^2 - 9z + 8 = 0 \rightarrow z_1 = 8 = x^2 \Rightarrow x_{1/2} = \pm \sqrt{8}$
Lsg. formel $z_2 = 1 = x^2 \Rightarrow \underline{\underline{x_{2/4} = \pm 1}}$

b. $2z^2 - z - 28 = 0 \rightarrow z_1 = -\frac{7}{2}$ (!)
Lsg. formel $z_2 = 4 = x^2 \Rightarrow \underline{\underline{x_{1/2} = \pm 2}}$

c. $3\sqrt{x-1} = \sqrt{x^2+9} \quad | \text{quadrieren}$

$$9(x-1) = x^2+9$$

$$x^2 - 9x + 18 = 0 \rightarrow \underline{\underline{x_1 = 3, x_2 = 6}}$$

Lsg. formel

Kontrolle $3\sqrt{3-1} = \sqrt{9+9} \quad 3\sqrt{6-1} = \sqrt{36+9}$

d. $0 = 1 - 2x - \sqrt{3 - 4x}$ | Wurzel auf eine Seite!

$$\sqrt{3 - 4x} = 1 - 2x$$

| Quadrieren

$$3 - 4x = 1 - 4x + 4x^2$$

(Binom!)

$$4x^2 = 2$$

$$x^2 = \frac{1}{2} \Rightarrow x_{1/2} = \pm \sqrt{\frac{1}{2}}$$

Kontrolle: $0 = 1 - 2 \cdot \sqrt{\frac{1}{2}} - \sqrt{3 - 4 \cdot \sqrt{\frac{1}{2}}} \neq 0$

$$0 = 1 - 2 \left(-\sqrt{\frac{1}{2}}\right) - \sqrt{3 - (4 \cdot (-\sqrt{\frac{1}{2}}))} = 0$$

also $x = -\sqrt{\frac{1}{2}}$ ✓

15. $x, x+1, x+2, x+3, x+4, x+5$

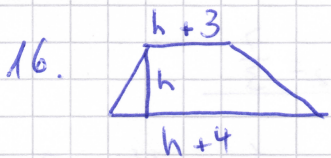
$$x(x+1) = 3(x+2+x+3+x+4+x+5)$$

$$x^2 + x = 3(4x + 14)$$

$$x^2 + x = 12x + 42$$

$$x^2 - 11x - 42 = 0 \xrightarrow{\text{Lsg. formel}} \underline{x = 14}$$

(-3 ist nicht möglich)



$$A = m \cdot h = \frac{a+c}{2} \cdot h$$

$$2 = \frac{h+3+h+4}{2} \cdot h$$

$$4 = (2h+7) \cdot h$$

$$4 = 2h^2 + 7h$$

$$0 = 2h^2 + 7h - 4 \xrightarrow{\text{Lsg. formel}} \underline{h = 0.5}$$

17. Formel oder quadratisches Ergänzen

18. a. $f(-6) = \frac{1}{2}(-6)^2 - 7(-6) - \frac{1}{3} = \underline{\underline{59.67}}$

b. $20.292 = \frac{1}{2}x^2 - 7x - \frac{1}{3}$

$$40.584 = x^2 - 14x - \frac{2}{3}$$

$$0 = x^2 - 14x - 41.25 \xrightarrow{\text{Lsg. formel}} \underline{x_1 = -2.5}$$

$$\underline{x_2 = 16.5}$$

19.

$$y = ax^2 + bx + c$$

$$y = a(x-u)^2 + v$$

S(u/v)

$$y = a(x-x_1)(x-x_2)$$

 x_1, x_2 : Nullstellen

$$y = a(x+1)^2 - 4$$

da S(-1/-4)

$$0 = a(5+1)^2 - 4$$

da N(5/0)

$$a = \frac{4}{36} = \frac{1}{9}$$

$$\text{also } \underline{y = \frac{1}{9}(x+1)^2 - 4}$$

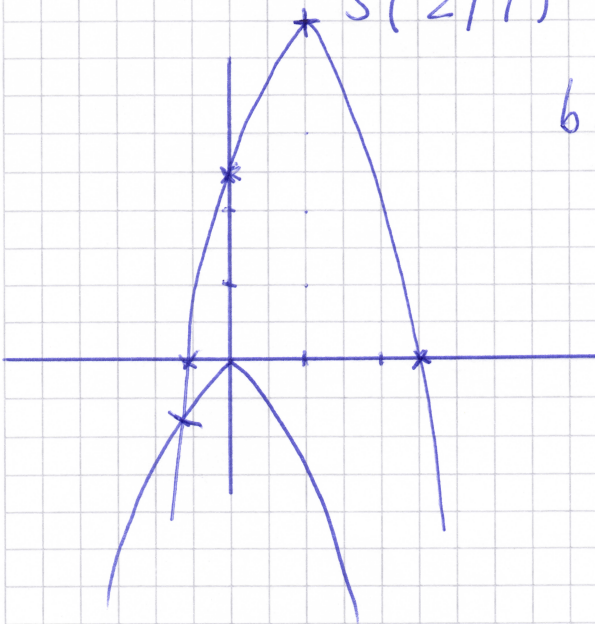
20.

$$f(x) = -x^2 + 4x + 5$$

$$a. \quad 0 = -x^2 + 4x + 5$$

$$N_1(-1/0), N_2(5/0)$$

$$S(2/9) \rightarrow \underline{f(x) = -(x-2)^2 + 9}$$



b. aufzeichnen und S bzw. a ablesen!

$$c. \quad -x^2 = -x^2 + 4x + 5$$

$$\underline{x = -\frac{5}{4}, \quad y = \frac{25}{16}}$$

21.

$$4 = a + b + c$$

$$7 = 16a + 4b + c$$

$$1 = 49a + 7b + c$$

$$3 = 15a + 3b$$

$$b = 3.5$$

$$-(-6 = 33a + 3b)$$

$$c = 4 - a - b$$

$$9 = -18a - 1 \quad a = -0.5 = \underline{1}$$

22.

$$y = (x-5)^2 - 9$$

Maximum S(5/-9)