

Mathematics - Formulary

1. Linear functions

$$y = mx + c$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

2. Quadratic equations

- abc-formula ($ax^2 + bx + c = 0$)

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

- pq-formula ($x^2 + px + q = 0$)

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

- Vieta's formulas:

$$x_1 + x_2 = -p = -\frac{b}{a}$$

$$x_1 \cdot x_2 = q = \frac{c}{a}$$

3. Quadratic functions

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

- Vertex: $V(x/y)$
 when $y = x^2 + px + q$

$$V\left(\frac{-p}{2} / q - \frac{p^2}{4}\right)$$

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

$$V\left(\frac{-b}{2a} / c - \frac{b^2}{4a}\right)$$

- Vertex form
 (completing the square)

$$y = a(x - x_0)^2 + y_0$$

$$\rightarrow \text{Vertex: } V(x_0/y_0)$$

4. Powers / Roots

$$a^m \cdot a^n = a^{m+n}$$

$$a^m : a^n = a^{m-n}$$

$$(a^m)^n = a^{m \cdot n}$$

$$a^m \cdot b^m = (ab)^m$$

$$a^{-m} = \frac{1}{a^m}$$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

5. Logarithms

$$\log_a c = b \leftrightarrow a^b = c$$

$$\log(u \cdot v) = \log u + \log v$$

$$\log\left(\frac{u}{v}\right) = \log u - \log v$$

$$\log(u^v) = v \cdot \log u$$

$$\log_a c = \frac{\log_{10} c}{\log_{10} a}$$

6. Financial mathematics

r: annual interest rate; f: interest factor
 p₀: principal; p_n: compounded amount
 n: duration (number of years)

$$f = \left(1 + \frac{r}{100}\right)$$

$$p_n = p_0 \cdot f^n$$

$$p_0 = \frac{p_n}{f^n}$$

$$f = \sqrt[n]{\frac{p_n}{p_0}}$$

$$n = \frac{\log_{10} p_n - \log_{10} p_0}{\log_{10} f}$$

Mathematik - Formelsammlung

1. Lineare Funktionen

$$y = mx + b$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

2. Quadratische Gleichungen

- abc-Formel ($ax^2 + bx + c = 0$)

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

- pq-Formel ($x^2 + px + q = 0$)

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

- Sätze von Vieta:

$$x_1 + x_2 = -p = -\frac{b}{a}$$

$$x_1 \cdot x_2 = q = \frac{c}{a}$$

3. Quadratische Funktionen

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

- Scheitelpunkt: $S(x/y)$

$$\text{bei } y = x^2 + px + q$$

$$S\left(\frac{-p}{2} / q - \frac{p^2}{4}\right)$$

$$\text{bei } y = ax^2 + bx + c$$

$$S\left(\frac{-b}{2a} / c - \frac{b^2}{4a}\right)$$

- Scheitelpunktform
(quadratische Ergänzung)

$$y = a(x - x_0)^2 + y_0$$

$$\rightarrow \text{Scheitelpunkt: } S(x_0/y_0)$$

4. Potenzen / Wurzeln

$$a^m \cdot a^n = a^{m+n}$$

$$a^m : a^n = a^{m-n}$$

$$(a^m)^n = a^{m \cdot n}$$

$$a^m \cdot b^m = (ab)^m$$

$$a^{-m} = \frac{1}{a^m}$$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

5. Logarithmen

$$\log_a c = b \leftrightarrow a^b = c$$

$$\log(u \cdot v) = \log u + \log v$$

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$$\log(u^v) = v \cdot \log u$$

$$\log_a c = \frac{\log_{10} c}{\log_{10} a}$$

6. Zinseszinsrechnung

p: Zinssatz

q: Zinsfaktor

K₀: Anfangskapital

K_n: Endkapital

n: Laufzeit (Jahre)

$$q = \left(1 + \frac{p}{100}\right)$$

$$K_n = K_0 \cdot q^n$$

$$K_0 = \frac{K_n}{q^n}$$

$$q = \sqrt[n]{\frac{K_n}{K_0}}$$

$$n = \frac{\log_{10} K_n - \log_{10} K_0}{\log_{10} q}$$